DEC 31 1947

ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION

DECEMBER 25, 1947

Traveling plant places 3-in. soil-cement lining in Oklahoma irrigation canal

In This Issue —

DESIGNING ECONOMY INTO HOUSING

SWIMMING POOLS NEED ENGINEERING

Here's why one engineer specified

"BYERS WROUGHT IRON PIPE" for replacements

In the course of a plant overhaul, a Pennsylvania engineer tore down an old ammonia condenser, installed just after the turn of the century.

The pipe was encrusted with sediment on the outside and to the casual glance seemed to be reaching the "end of its string." But careful inspection and testing told a different story . . . as the illustrations show.

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Volume 139 • Number 26

December 25, 1947

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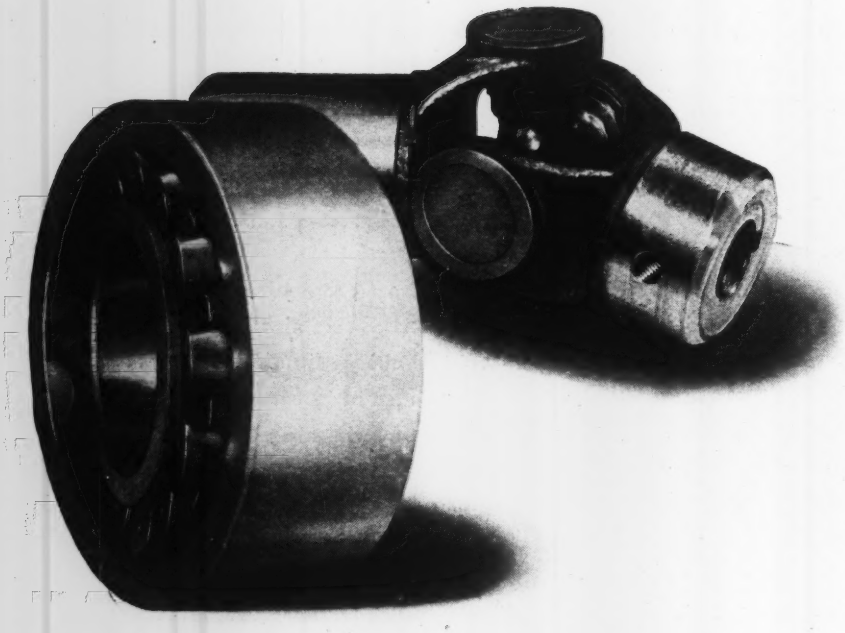

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Construction Trends

Building Cost Indexes Compared

Engineering News-Record construction and building cost indexes rose 7.2 percent and 7.3 percent, repectively, from June to December of this year. Other weighted indexes are not available for a comparable period. The E. H. Boeckh index, which is available through November, however, showed an increase of 5.2 percent from June to November. This compares with an increase of 6.5 percent in the Engineering News-Record construction cost index and 6.3 percent in the building cost index.

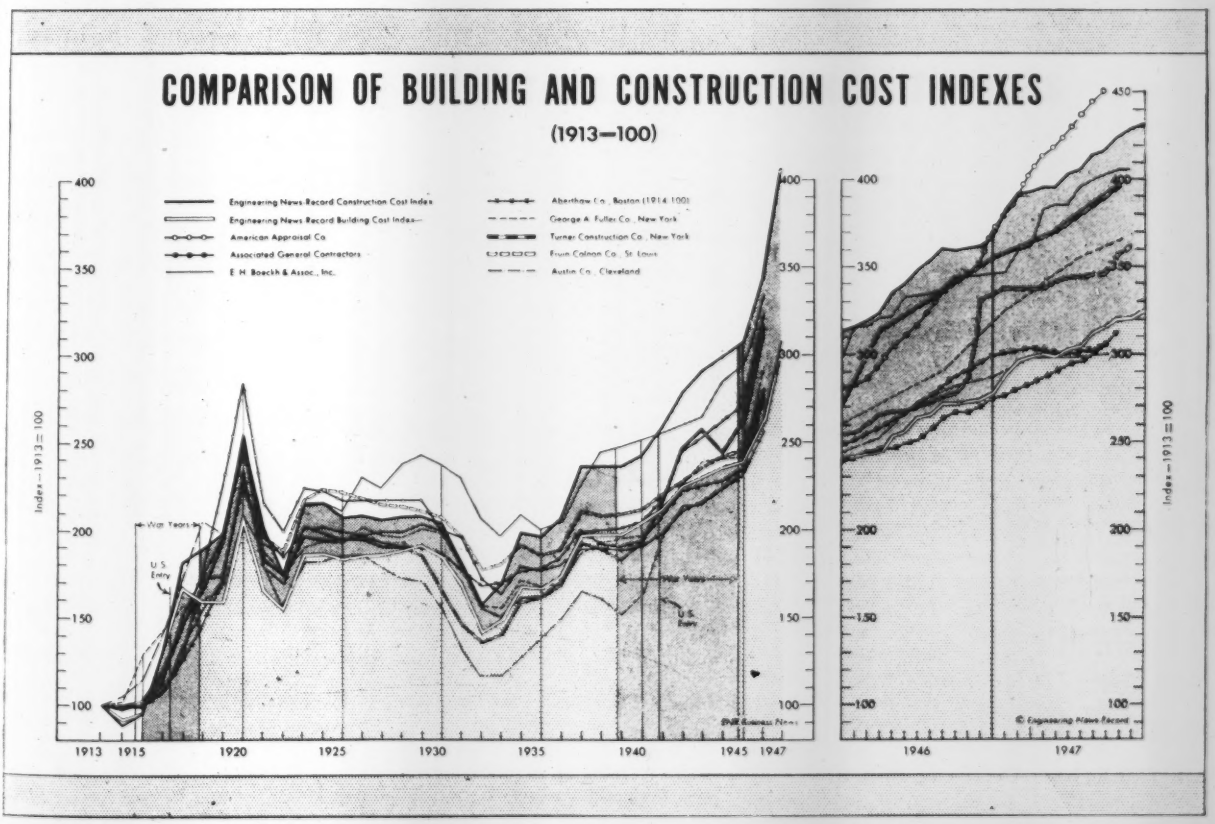
The Associated General Contractors index, available through October, rose 6.1 percent from June to October as compared with a rise of 5.2 percent in the Engineering News-Record construction cost index and 5.9 percent in the building cost index.

With the exception of the Turner index, contractor indexes showed smaller gains in the third quarter of 1947 than the weighted indexes. Contractor indexes are adjusted for "hidden" cost elements such as overtime payment, job productivity and the availability of materials and labor. The Fruin-Colnan index rose 0.9 percent from June to September, the Aberthaw and Austin indexes, 1.3 percent and the Fuller index, 2.2 percent. The increases in the Engineering News-Record construction and building cost indexes for this period amounted to 3.7 percent and 4.6 percent, respectively. The Associated General Contractors and the Boeckh indexes rose 4.4 percent and the American Appraisal, 5.9 percent.

The Turner index, which has been reported for May and October only, showed a rise of 7.8 percent during this five-month period. The Engineering News-Record construction cost index for the same period rose 7.1 percent and the building cost index, 7.0 percent.

HISTORICAL RECORD OF CONSTRUCTION COST INDEXES

WEIGHTED INDEXES	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
ENR Construction	382	391	392	396	396	403	407	415	418	424	429	432
ENR Building	289	298	299	301	300	303	305	313	317	321	322	325
American Apprajsal	381	390	404	414	419	427	437	446	452	...	...	...
Associated General Contractors	277	280	282	286	290	294	295	300	307	312	...	...
E. H. Boeckh	346	360	362	383	385	385	395	400	402	405	405	...
CONTRACTOR INDEXES												
Aberthaw	...	...	304	...	...	300	...	...	304	...	...	...
George A. Fuller	...	...	...	310	...	...	357	...	...	365	...	...
Turner	...	...	...	...	371	...	...	...	...	400	...	...
Fruin-Colnan	338	338	338	338	342	344	344	347	347	358	362	...
Austin	...	...	298	...	...	298	...	...	302	...	...	...



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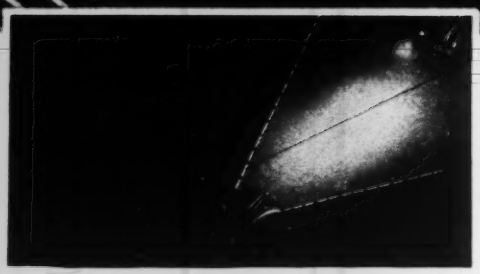
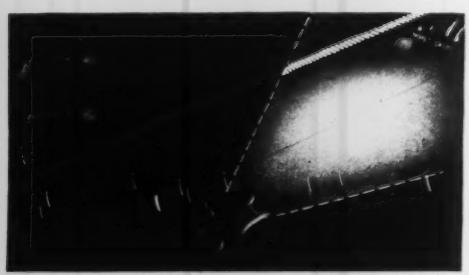


A smooth curb wastes the car's headlights. It reflects light away from the driver. Edge of road is difficult to see. Driving dangers are increased.



White Concrete Reflecting Curb utilizes the car's headlights. Saw-tooth faces mirror the light back to driver; form a continuous, bright ribbon of light at the road's edge. Driving is safer.

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News of the Week

ENGINEERING NEWS-RECORD • DECEMBER 25, 1947 • VOLUME 139 • NUMBER 26

No new Colorado River jobs until states agree on water

Report of Bureau of Reclamation on Colorado Basin points up disagreements among states in watershed—Bureau will make no new recommendations

There will be no recommendation from the Bureau of Reclamation for construction of further projects in the Colorado River Basin until the states in the basin—Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming—reach agreement on their respective rights to the available water.

This is the conclusion reached by Commissioner Michael W. Straus in his transmittal of an interim report to the Congress. This report follows a comprehensive study of developments of water resources in the Colorado River Basin published by the Bureau of Reclamation in March 1946 and then submitted to the states and federal agencies for review and comment before presentation to the Congress.

Many of these comments—particularly those from Arizona, Colorado and California—which form the major part of the interim report, are quite critical. However, says Commissioner Straus, ". . . the comments . . . appear to be intended not so much to criticize the report as to explain or advance the commenting states' position with respect to the division of water of the Colorado River system."

Purpose of the report

The Bureau of Reclamation report describes the Colorado River Basin resources, its present development and its needs and problems. It presents an inventory of 134 potential projects for water development within the basin and evaluates the overall benefits and costs of these projects as an indication of what might be expected from full water-resource development.

The scope and purpose of the report appears generally to have been understood, says Commissioner Straus, although in some instances they have been misconstrued by some of the commenting states and federal agencies. A number of comments are directed to the lack of detail in such items as economic analyses of individual projects, water supply studies, land classification, groundwater investigation, and silt control.

It is said that serious consideration was given possible selection and recommendation of a group of projects for the most beneficial and fullest utilization of the available water supply, that group to comprise a comprehensive plan of development. The utility of such a selection was considered questionable, however, because of a lack of agreement among the states as to their respective rights to the flow in the river system.

No agreement on water rights

Although the Colorado River compact divides the water between the upper basin and lower basin, it makes no division among the states within each basin. A compact commission is now attempting to apportion upper-basin water among the states of that area (Colorado, New Mexico, Utah and Wyoming. Similar action has not yet been taken by the lower-basin states (Arizona, California and Nevada), although Congressional resolutions recently have been introduced calling for court decision on lower basin waters.

The water rights situation in the Colorado River Basin is highly controversial, points out Commissioner Straus. The several documents bearing upon the matter are, in important particulars, variously interpreted by the states which are parties to them. In the realization that it was not within the scope or authority of the report to attempt to decide such controversial questions, a deliberate effort was made to avoid any interpretation of these documents.

Colorado has criticized the report for failing to make such interpretations of the contract and for failing to limit the inventory of potential projects in the lower basin to those which Colorado considers to be within the lower basin's water rights. California has commented that "projects should be analyzed and reported upon individually as to their engineering and economic feasibility and findings made relative thereto as required by law."

Viewed from both local and national standpoints, there is no doubt as to the urgency for continuing at once the development of the resources of the Colorado River, concludes Commissioner Straus. The principal obstacle is the fact that there is disagreement as to how the unused water shall be distributed among the states.

Delaware River Bridge bid opening postponed

Opening of bids for the initial contract of the new Delaware River Bridge near Wilmington, Del., has been postponed from Dec. 17 to Jan. 6, it was announced by Lieut. Gen. Eugene Reybold (Ret.), director of the Delaware crossing division of the Delaware Highway Department.

General Reybold said the date was changed at the request of the bidders. The contractors claim they have not had sufficient time to make the necessary engineering explorations and calculations. All asked for an extension of three weeks.

$12 million Grapevine Dam construction starts

Recent ground-breaking ceremonies marked start of work on the $12,000,000 Grapevine Dam and reservoir on Denton Creek—a tributary of Trinity River—near Grapevine, Tex.

The reservoir will cover more than 7,000 acres, and will have a length of over ten miles with a total shore line of 61 miles. It will furnish Dallas with water storage of 85,000 ac.ft. and adjacent Highland Park and University Park with water storage of 50,000 ac.ft.

Contractor on initial construction work is J. W. Moseley of Garland, Tex. J. J. Russell is resident engineer.

NEWS IN BRIEF

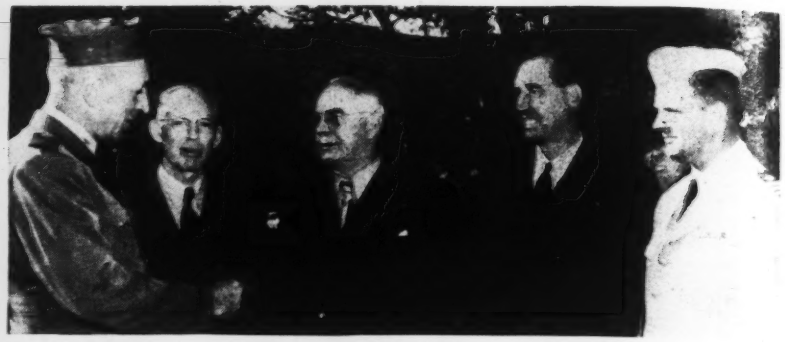
In telegraphic form, here are late news developments on the engineering and construction front during the week.

Housing—Permits have been granted for Monroe Park Homes at *Wilmington, Del.*, to cost about $3,650,000 . . . Excavation has started by Simon Bros. for a 19-story cooperative apartment building on the site of the Whitney mansion at Fifth Avenue and 68th Street, *New York City.*

Sewers and water supply—*Salt Lake County, Utah*, commissioners recently rejected all seven bids received for construction of a suburban sewer system. The lowest of two bids received was $3,135,000 by Morrison-Knudsen Co., Inc., and was about $500,000 higher than estimates . . . *Dallas, Tex.*, has voted an $11,000,000 revenue bond issue for a two-year water and sewer expansion program . . . *Lubbock, Tex.*, has voted a $4,924,000 municipal bond issue for sewer, water and electric expansion . . . A two-year, $1,000,000 water well drilling program for *Houston, Tex.*, has started. Indiana Stream Pollution Control Board has approved final plans of four cities and two industrial firms to improve sewage treatment facilities, at a total cost of about $9,000,000. They were for the *South Bend* sewage treatment and garbage disposal works, secondary treatment units for sewage treatment works in *Indianapolis*, sewage treatment works and sewers in *Rushville*, east-side intercepting sewer in *Evansville*, and treatment facilities at the Kentland Dairy Products Co., Inc. *Mulberry*, and Whistler Packing, *Elkhart County.*

Industrial Construction—The construction of a $1,500,000 spark-plug manufacturing plant on a 20-acre site at *Garland, Tex.*, has been announced by the Champion Spark Plug Co. of Toledo, Ohio . . . The most modern coal and ore docks on the Great Lakes—an $18,500,000 facility being built jointly by New York Central and Baltimore and Ohio Railroads—will open at Toledo, Ohio next spring.

Miscellany—A long-range highway plan for the area of Columbus, Ga., estimated to cost $12,290,000 was made public recently by the State Highway Department. . . . The University of Cincinnati, *Cincinnati, Ohio*, will proceed at once with a building program to involve expenditure of several million dollars over a period of years.



***San Diego Gets Water**—Concluding a long battle for adequate water supplies, citizens of San Diego, Calif., watched recent ceremonies marking opening of the 71-mi. San Diego Aqueduct. Attending were, left to right: Capt. A. K. Fogg, CEC, USN; J. L. Burkholder, general manager and chief engineer, San Diego County Water Authority; F. A. Rhodes, city manager; G. E. Arnold, city water director, and Comdr. R. D. Thorson, CEC, USN.*

As water began to flow through the conduit, citizens of San Diego, Calif., held a civic celebration to honor the engineers and construction men who built the city's 71-mi., $14,500,000 aqueduct.

The aqueduct (*ENR*, March 6, 1947, vol. p. 363) brings water from the Colorado River across desert country and through several tunnels into the San Vicente Reservoir, a few miles north of the city. Undertaken as a wartime measure by the Navy Department to assure supplies for naval installations, the aqueduct work was scheduled for cancellation in 1945, when arrangements were made for the Navy to complete the project for the city.

Capt. Alden K. Fogg, public works officer for the 11th Naval District and director of the aqueduct construction, turned over control of the project to J. L. Burkholder, chief engineer and general manager of the San Diego County Water Authority at the San Vicente Dam.

The aqueduct is to deliver 50 mgd. from its tie-in with the Metropolitan Aqueduct at San Jacinto, and is actually capable of delivering 67 mgd., according to recent tests.

At a dinner celebrating the event, citations were presented to sixteen men for their outstanding contribution to the development project. Among them were Fred Pyle, San Diego City water engineer; Fred G. Rhodes, city manager; G. E. Arnold, director of the city water department; Commander, R. D. Thorson, resident engineer in charge of construction for the Navy, and field engineers and construction men.

Move to raise FHA mortgage funds

The House Committee on Banking and Currency has reported out a bill (H. R. 4675) that increases greatly the authorization of the Federal Housing Administration to insure mortgages on new residential construction under Title VI of the National Housing Act.

As finally agreed upon by the committee, the bill makes available immediately $250,000,000 of authorization and permits the President to increase the total by $500,000,000 if necessary.

The new immediate authorization is only one-half of that in the original form of the bill placed before the committee. Authorizations under previous laws total $4.2 billions.

Testimony before the committee indicated that there is now in process in FHA's field offices applications for mortgage insurance under Title VI totalling about $445,000,000. More than 30 percent of all new permanent residential construction is being financed with the assistance of Title VI, it was reported.

The committee points out that increased authorization is a stopgap measure made necessary by a vigorous and contraseasonal expansion of residential construction. Title VI was originally adopted as a temporary measure to stimulate housing construction. It is the intention of the committee to review the whole subject of Title VI prior to its termination on March 31, 1948, in order to determine to what extent the provisions of the measure might be modified.

Inter-American sanitary engineers schedule meet in Chile next April

Week-long congress and exhibit to inaugurate activities of Inter-American Association of Sanitary Engineering.

Sanitary engineers of the Western Hemisphere will have an opportunity to meet and exchange ideas in April of this year when the Inter-American Association of Sanitary Engineering holds a congress at Santiago, Chile.

Plans for the congress were unfolded last week by Donald L. Snow, acting secretary of the association at a meeting with editors of the engineering press, directors of professional associations and manufacturers' representatives in New York City.

Since its formation a little more than a year ago (*ENR* Oct. 10, 1946, vol. p. 471), membership of the IAASE has grown to 986, of which 251 are in the United States. The latter group will soon arrange for regular meetings of its members, these to take place in conjunction with meetings of other professional societies. Both the American Water Works Association and the American Public Health Association already have indicated their willingness to cooperate in such arrangements. A spokesman for the American Society of Civil Engineers believes that this group likewise will be happy to participate with IAASE in holding its meetings.

Plans for the Chile meeting

The congress, which is being sponsored by the Chilean section of the IAASE, will convene for one week, beginning April 8, at the University of Chile in Santiago. An attendance of about 250 engineers from the United States and the 21 South American republics is anticipated. Space will be provided for the exhibit of manufacturers' equipment.

Active support for the convention will also be provided by the health and sanitation division of the Institute of Inter-American Affairs, according to Clarence I. Sterling, Jr., chief engineer. Mr. Sterling stated that his organization, which is engaged in cooperative public-health programs in many of the Latin American countries, will have representation from field parties in these areas. He also stated that Gordon M. Fair, dean of the graduate school of engineering at Harvard and a consultant to the institute, will be an official delegate at Santiago meeting.

Details covering transportation arrangements, housing and exhibits for the meeting in Chile may be obtained by addressing Mr. Snow at the Pan-American Sanitary Bureau, 17th and Constitution Ave., Washington 6, D. C.

Deaths, injuries result from apartment collapse

At least one person was killed and twelve were injured when six floors of the Empire Apartments at 9th St. and New York Ave., N. W., in Washington, D. C., failed December 16.

No plans for the 54-year-old building are available, but a permit filed early in 1893 reveals that exterior walls of the seven-story-with-basement structure were of brick, varying from 27 in. thick in the basement to 13 in. on the top floor. Interior walls were of similar construction. No details are available as to the framing of the building, except that timber floor joists supported on steel floorbeams were used.

There is some difference of opinion as to the cause of the failure. When the accident occurred, an area about 30 ft. square failed on all except the ground floor. This floor and the roof remained intact. First reports said a portion of the top floor gave way, causing successive collapse of lower floors. District of Columbia Engineers said later that a portion of the second floor might have failed first.

Damage to the 96 x 146-ft. structure was estimated at $250,000. The owner said that the three upper stories will be razed and the lower ones converted into stores."

Ask VA hospital bids at Little Rock, Spokane

Col. G. E. Galloway, Little Rock, Ark., district engineer of the Corps of Engineers has issued an advance notice to bidders on construction of a new 500-bed VA hospital at Little Rock.

The installation was designed for a general medical hospital, and the plans call for construction of a group of nine buildings.

The main building will be of reinforced concrete, eleven stories high, exclusive of the basement, and will consist of three wings in the shape of a "Y". The exterior finish for the ground floor and first floor will be cut stone, and the upper stories will be faced with buff brick. The exterior design features the use of continuous windows giving the effect of horizontal bands, divided at intervals by narrow pier panels faced with dull red terra cotta.

Architectural and engineering design for the project was performed by Brueggeman, Swaim, and Allen, and Erhart, Eichenbaum, and Rauch, Little Rock.

The Corps of Engineers has also announced that it plans to ask bids about Jan. 9 for a VA hospital at Spokane, Wash. This will be a 200-bed institution consisting of a main building, and six auxiliary buildings.

A. M. Maxwell heads The Asphalt Institute

At their annual meeting held in New York City recently, directors of The Asphalt Institute elected A. M. Maxwell of The Standard Oil Co. (Ohio), Cleveland, Ohio, president and chairman of the executive committee.

Other officers named were: Wallace D. Craig, Standard Oil Co. of New Jersey; D. M. Myers, Byerlyte Corp.; L. W. Lee of Husky Refining Co.; Harold J. Buck of Talco Asphalt & Refining Division, American Liberty Oil Co.; and N. H. Angell of Standard Oil Co. of California, completing the executive committee.

A. M. Maxwell

The five vice-presidents are: Division I: Atlantic-Gulf, Wallace D. Craig; Division II: Ohio-Great Lakes, D. N. Myers; Division III: Mid-West, L. W. Lee; Division IV: Southwest, Harold J. Buck; Division V: Pacific Coast, N. H. Angell.

Bernard E. Gray was re-elected general manager-chief engineer, and Herbert Spencer, secretary. F. V. Widger, Witco Chemical Co., was re-elected treasurer and John N. Smith, Socony-Vacuum Oil Co., Inc., assistant treasurer.

Over 100,000 apprentices in construction trades

The number of registered apprentices in all skilled trades reached a record 183,000 this month, with more than 113,000 employers participating in apprentice programs, it is reported by William F. Patterson, director of U. S. apprentice-training service. There are more than 109,700 apprentices in construction trades, also a record.

Of 113,089 establishments participating in the training program, 61,061 are in construction.

Expressways, road safety and soils discussed at highway research meeting

Concluding sessions at annual meeting of Highway Research Board consider many subjects—New truck study authorized

Research problems involved in the construction of expressways through cities, highway safety and numerous questions relating to the stabilization of soils for highway use were considered at the general session of the Highway Research Board annual meeting and at the concluding division meetings, held in Washington Dec. 3-5. Reports of the earlier sessions were published in the Dec. 18 issue, vol. p. 833.

Traffic from expressways

The greater part of one evening's session was given over to a discussion of an important aspect of the construction of limited-access expressways through cities, namely, the effect of traffic flowing through and from such expressways on city streets.

The committee charged with developing information on this subject is headed by Charles M. Noble, state highway engineer of New Jersey.

Nathan Cerniack, economist of the Port of New York Authority, discussed the need of adequate parking and terminal facilities near the exits from expressways passing through cities, basing much of his comment on studies made by the Port Authority for bus and truck terminals soon to be built in New York City and in Newark. He pointed to the need for adding extra-lane capacity to such expressways at exit points in cities to insure that traffic congestion in the streets does not produce a traffic bottleneck on the expressway due to the inability of cars to leave the expressway freely.

The pros and cons of stage construction of expressways through cities was discussed by Fred J. Hughes of the Public Roads Administration. Stage construction, he said, may help to stretch the available funds, but only should be adopted as a last resort as it generally does not provide adequate relief, and may even increase congestion within the city. Mr. Hughes laid special stress on the importance of studying the effect of traffic flowing to and from such expressways on congestion in the city streets.

Express route selection

R. M. Brown, assistant engineer of road design in charge of metropolitan surveys, Indiana State Highway Commission, outlined methods to be followed in determining the route to be followed by expressways through cities, based on origin and destination surveys. He presented a formula developed in their studies to evaluate the service that expressways will render to potential traffic. Ultimately, his department hopes to develop a mechanical device for use in applying this method, which should result in a great saving of time.

Influence of expressways on diversion of traffic from alternate routes and the generation of new traffic was the subject of a paper by Roy E. Jorgensen, chief engineer of the Connecticut State Highway Department. He described in detail the way completion of the South Meadows Expressway affected traffic in the Hartford area and how traffic has developed on the Merritt and Wilbur Cross parkways. He concluded that engineers should guard against too optimistic reports as to the amount of traffic that will use expressways to simply save time.

Harry W. Lochner of H. W. Lochner & Co., appealed to highway planners to consider new expressway improvements as part of an overall plan for improvement of a city. In this broader scope of highway planning, he said, the stability of the several areas and the possible expansion of industrial zones should be carefully considered.

Traffic studies simplified

A simplified method for travel studies in small cities was described by Daniel O'Flaherty of the Washington office of PRA. This method is a combination of origin-destination and parking surveys, producing information concerning the most important traffic movements in the smaller cities and yet is not too costly. Cities reported as having taken advantage of the improved method included: Portsmouth, N. H.; Walla Walla, Wash.; Alexandria and Monroe, La.; Corpus Christi, Tex., and Anderson, S. C.

At the first session on traffic and operations this group was told by Lloyd Braff of De Leuw, Cather & Co., that application of the metropolitan origin-destination survey method for studying highway improvement needs can be used to great advantage in evaluating the transit needs of a city. Already the method has been used with success in Portland, San Francisco, Cincinnati, Nashville, Atlanta and Providence.

Means of evaluating intersection improvements in rural areas were discussed by Leon Corder, senior maintenance engineer of the Missouri State Highway Department. It was pointed out that although expenditure for intersection control devices represents the largest single amount expended by the state of Missouri for traffic control, 27 percent of highway accidents in the state still occur at crossroads. Despite the advances made in traffic control at urban road intersections, little work appears to have been done on the corresponding problems in rural areas.

Reconstruction rating

Considerable discussion was stimulated by a paper by Karl Moskowitz of the Public Roads Administration office in Phoenix, Ariz., describing a numerical rating system developed there as a basis for determining construction programs.

Setting the "basic efficiency" at 100, 35 points are assigned to structural adequacy, 30 points to safety, and 35 points to dispatch, and these are further broken down into subdivisions such as condition, remaining life, width and sight distances, to each of which is assigned a par factor. This system was found very useful in comparing roads having about the same traffic volume and in determining which should get priority in reconstruction. A system also was developed for making adjustments for traffic volume.

Highway safety studies

In outlining needed highway accident research before the session dealing with highway administration, Sidney J. Williams of the National Safety Council appealed for three major types of work. Improvement of automobile headlights, behaviour of long vehicles and combinations, and determination of those drivers prone to have accidents were the three types. He stressed that the human element in highway accidents has received too little attention.

Virginia is now cooperating with its 100 counties to zone state routes in metropolitan areas to facilitate later improvement. E. W. Turner of the Virginia State Planning staff informed the roadside planning group. In keeping with a state law passed a few years ago calling for a 20-year improvement program, 10 counties have already adopted zoning laws that permit adequate "setback" distances to be established along routes scheduled for later improvement. Six more counties are working on similar ordinances. By this means—keeping land immediately adjacent to the road free of buildings and other improvements, cost of future construction will be greatly reduced.

Similar advancement in Illinois was reported in discussion of Mr. Turner's

talk. Nine Illinois counties have set up zoning regulations and eight others have adopted the "set-back" plan. The state considers desirable a set-back distance equal to one-half of the width of right-of-way, plus 30 ft. for future improvement of the road.

Use of polarized light

A proposal that the Highway Research Board inaugurate a study of the use of polarized light for automobile headlights started an animated discussion at the general meeting of the board on Wednesday morning. The proposal came from Edwin H. Land, president of the Polaroid Corp., who described the advantages of using polarized headlights and viewers as a means for elimination of the blind driving zone created by the headlamps of opposing cars with even the best type of standard automobile headlights.

Mr. Land said the cost of the polarized light equipment to manufacturers was about $7 and that it appears to him that the manufacturers might absorb the added cost of this equipment. However, he stated that they put the added cost of equipping an automobile with headlights, viewers, etc. at from $30 to $80.

In discussion of Mr. Land's paper, V. J. Roper of the General Electric Company cited the increased risk encountered by the driver of an automobile not equipped with polarized light headlights when passing one so equipped without its beam depressed and stated that this risk might result in restrictive legislation after cars with polarized headlights began operating on open roads.

J. H. Hunt of the Automobile Manufacturers Association characterized Mr. Land's figures of the cost of equipping cars as "wholly unrealistic." He cited the fact that the polarized headlights can only be used on rural roads, that they cannot be used for driving on city streets, hence each car has to be equipped with two complete sets of headlights and a larger generator. He said that the automobile industry, in cooperation with the General Electric Company and the Polaroid Company, has developed a complete set of lights for use with this system but that the industry is opposed to its introduction at this time, due to serious questions as to its usefulness and the added risk for drivers of cars not so equipped.

Long-range highway studies

G. Donald Kennedy, vice president, Automotive Safety Foundation, said that encouraging progress is being made in the development of state long-range highway programs. The preparation of such long-range reports has been completed or is under way in the following states: California, Pennsylvania, Michigan, Kentucky, Washington, Oregon, Kansas, Nebraska and Colorado. Mr. Kennedy stressed the importance of studying the impact of such plans on the state's future economy, and the need for considering such future changes in road use as those that would result from decentralization of industry. Also, he laid special stress on the need for putting such reports up in a form that will be easily understood by laymen.

Map for highway use

A feature of the general session was the presentation of a statement by Col. Gerald FitzGerald of the U. S. Geological Survey outlining the types of topographic maps that now are available to highway engineers. Col. FitzGerald said that under a policy recently adopted by the survey, the original map manuscripts to scales as large as 1:5,000 can be made available to highway departments at a small cost. These can be obtained from 12 to 18 months after initiation of the map project.

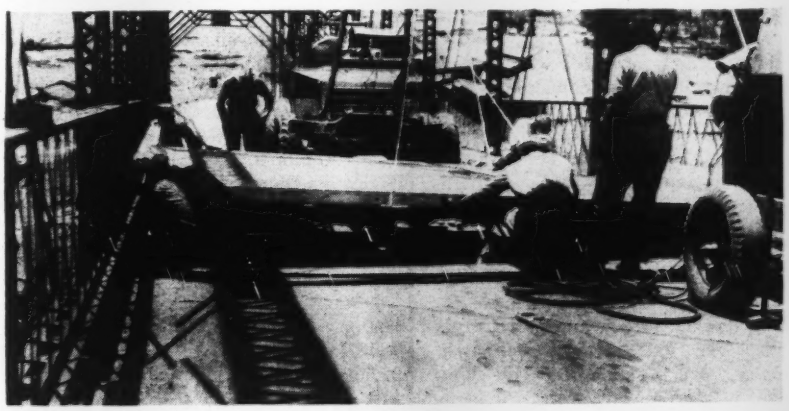
The map information office of the Geological Survey has an index of aerial mosaics made by state, federal and private agencies which can be consulted for information as to available aerial surveys.

Part of the final session was given over to consideration of a paper by Earl F. Bennett and G. W. McAlpin of the New York State Department of Public Works outlining the system developed in New York State for recording soil characteristics on maps for use of the engineers of the state highway department. Further information on this subject was presented by Prof. Donald J. Belcher of Cornell University, Clifford A. Kaye of the U. S. Geological Survey, and P. L. Melville of the Virginia Department of Highways.

Properties of soils

A novel feature of the meeting was the presentation at one session of a group of five papers all of which dealt with fundamental theoretical properties of soils. It was remarked that this attention to fundamental theory marked a definite step forward in the application of soil mechanics in highway engineering. C. E. Jacob of the University of Utah presented a discussion of theories of the moisture distribution in the air voids of a soil above the water-table and linked this to a consideration of the meaning of specific yield—a matter of considerable importance to the water supply engineer who has to look at ground water from the opposite point of view to that of the engineer concerned with highway drainage.

Hans F. Winterkorn and Gregory P. Tschebotarioff of Princeton University presented another joint report on an



***Old Bridge, New Floor**—A new deck of lightweight aluminum panels is now in use on this 35 year-old bridge spanning the Little Colorado River on U. S. Route 89, connecting Arizona and Utah. Installation of the new decking for the entire 600-ft. length of the bridge was accomplished in 21 days without major interruption to heavy interstate truck traffic by removing sections of the original timber decking and replacing them with 15 x 16-ft. panel sections of 3/8-in. gage aluminum resting on the steel stringers. Curbs are surplus Alcoa alloy 14S-16 originally manufactured for use in Army pontoon bridges. Use of the aluminum decking saved an estimated 130,000 lb. of dead load, engineers said.*

investigation of the sensitivity of clays to remolding. It has been known for some time that some clays have strength either unaffected or slightly increased by the operation of remolding, whereas other clay soils suffer a considerable loss in strength for the same reason. The practical importance of this phenomenon is chiefly related to the remolding induced by pile driving operations.

Studies of synthetic soils

Donald T. Davidson and A. L. Johnson of Iowa State College presented an interesting review of the fundamentals of clay technology with special reference to its application to soil stabilization. After discussing the fundamental properties of the main groups of clay minerals, they described experiments which had been made on "synthetic" soils made up of specially prepared graded mixtures of clean quartz particles with very small quantities of three principal clay minerals (sodium and calcium kaolinite and sodium bentonite.) The resulting grading curves for the artificial soils corresponded closely with the theoretical grading curve for a perfect mixture as given by the Talbot equation.

Electrical treatment of soils

The electrical treatment of soils was mentioned in this session, first by E. F. Preece of the U. S. Engineer Office who described special test laboratory facilities which were being developed by the U. S. Corps of Engineers and the University of Maryland for the study of "geotechnical" processes in soils. H. F. Winterkorn discussed the fundamental similarities of electro-osmotic and thermo-osmotic phenomena in soils. He prefaced his discussion by some interesting historical references mentioning that one of the first printed records of the effect of electrical discharges through soil was to be found in the proceedings of the Moscow Academy of Sciences for 1808—a date not far removed from the start of modern electrical investigations. He stated that some of the earliest experiments on electrical phenomena in soils were still unexplained theoretically despite all the attention which had been devoted to the subject in recent years. The movement of water in clay soils induced by electrical discharges was described and linked with corresponding movements of water in similar soils when they are subjected to varying temperature conditions.

The similarity of the two processes had led Dr. Winterkorn to the idea that an electrical potential should be created between hot and cold sides of a soil specimen being tested for thermo-osmotic conditions. This had therefore been tried in his laboratory and an electrical potential had been successfully measured under these conditions. Discussions suggested that these interesting scientific phenomena might eventually lead to important practical applications.

Stabilization with calcium chloride

Field studies of the use of calcium chloride for base stabilization have been begun in Alabama and in Virginia as a cooperative undertaking between the Highway Research Board and the state highway departments, according to reports by H. F. Clemmer, chairman of the Committee on Soil-Calcium Chloride Roads, and A. U. Theuer of the Highway Research Board staff. Construction of the 3½ mile project in Virginia has been completed. It has a sand-clay base with asphalt surfacing and is divided into three sections, one with 2½ lb. of calcium chloride per square yard, one with 5 lb., and one with no calcium chloride to act as a control section for the study.

The effect of calcium chloride on compactive effort and on water-retention characteristics was discussed by Prof. E. J. Yoder of Purdue University. Field tests conducted to date indicate that calcium chloride does make higher compaction possible, but there are inconsistencies that are not yet explained.

Drainage investigations

In reporting for the Committee on Surface Drainage of Highways, Carl F. Izzard of the Public Roads Administration paid tribute to the "Ohio Drainage Guide" of the Ohio Highway Department, which he stated was proving to be most useful in connection with practical drainage problems. He reported that four new cooperative agreements had been made between the U. S. Geological Survey and state highway departments for joint drainage investigations.

John C. Guillou of the University of Illinois described a large model which is under construction at Urbana for testing flow in gutters and storm drain inlets. The Congress Street Superhighway, officially known as the West Route, in the city of Chicago, is being used for this initial study as a "pilot" project. Experimental work will be started early in 1948.

Curtis L. Larson of the St. Anthony Falls Hydraulic Laboratory described the results of an intensive study of the flow through inlet gratings for city street gutters. Standard designs had been compared for performance with a new design utilizing bars arranged at 45 degrees to the line of flow, with improvement in results. Considerable increase in efficiency was developed by the use of specially rounded bar in the gratings, shaped to conform to overflow conditions. It was suggested that the use of this type of bar in grating design should not result in any considerable increase in cost. It was also found that the efficiency of gratings was considerably increased when a relatively small part of the total flow was allowed to pass over the grating along the gutter.

Officers and awards

Presentation of the Highway Research Board Award to Norman W. McLeod, consultant to the Department of Transport of the Dominion of Canada, for his paper "Airport Runway Evaluation in Canada", was made at the general meeting on Dec. 3 by Prof. Roger L. Morrison, chairman of the board. Mr. McLeod, who is an asphalt technologist for the Imperial Oil Co., directed the studies as part of a study of design methods for airport runways. An article by him summarizing the studies is to be published in *EVR* in the near future.

F. V. Reagel, engineer of materials, Missouri State Highway Department, Jefferson City, Mo., was elected chairman of the board to succeed R. L. Morrison, and R. A. Moyer, research associate professor of highway engineering at Iowa State College was elected vice-chairman. Roy W. Crum is director of the board.

Motor-vehicle study planned

Inauguration of a study of the operation of heavy motor vehicles to determine the relation of weight of truck to highway costs was announced during the meeting. The study is to be conducted by the board's Committee on Economics of Motor Vehicle Size and Weight in cooperation with the Public Roads Administration, the Pennsylvania Highway Department, the American Association of State Highway Officials, the American Trucking Associations, Inc., and other motor-vehicle organizations.

Tests are to be made in a mountainous section of southwestern Pennsylvania. Axle loads will range from 14,000 to 22,000 lb. and gross vehicle weights will vary from 20,000 to 142,000 lb.

The tests will be made on highways having a variety of grades and operating conditions and a close check is to be kept on fuel consumption, speeds and other factors entering into a comparison of the cost of operating trucks within the legal limits and those with higher gross loads or higher axle loading.

The papers referred to in this report together with others not noted will be published by the Highway Research Board in its PROCEEDINGS FOR 1947.

OBITUARY

Vernon Lowell Bell, 44, who helped design and build some of the principal public structures in Salt Lake City, Utah, died Dec. 2, in Phoenix, Ariz. A graduate of the University of Utah, 1925, Mr. Bell had been assistant engineer for the Southern Pacific Railroad of Mexico and later resident engineer for a private firm in Salt Lake City. From 1932 to 1942 he was resident and assistant district engineer for the Utah state road commission. During the war he was a supervising engineer for the U. S. Army Engineer Corps and Defense Plants Corp. He went to Phoenix two years ago as assistant plans engineer for the Arizona highway department.

Rear Admiral James Thomas Mathews, 56, U.S.N. (retired), of Florence, S. C., died Dec. 14 at Naval Hospital, Bethesda, Md. Admiral Mathews, who served in the Navy's Civil Engineer Corps, was decorated with the Order of Honor and Merit by Haiti in 1938. He received the Legion of Merit from the Navy and seven other service medals.

Hugh William Crawford, 60, former city engineer of Ponca City, Okla., died recently. Since 1930 he had been connected with the Phillips Petroleum Co.'s engineering department.

Thomas Phillips Charleson, 77, former marine construction engineer, died at Ottawa, Ont., Dec. 10. He had been a resident of Ottawa since 1883. In former years, he was occupied in the construction of wharves and breakwaters throughout the Maritime Provinces and on the coast of Gaspe. He has also constructed several of the larger wharves in the main harbor at Saint John, N. B.

Porter M. Lumpkins, 44, civil engineer in the Washington, D.C., Engineering Department, died Dec. 16.

William W. Zass dies; was Arkansas roads chief

William W. Zass, 58, for 15 years chief engineer of the Arkansas Highway Department died at Little Rock, Dec. 12.

Mr. Zass had been with the department since 1924 and had served as chief engineer since 1932. At various times he served as office engineer and consulting engineer on highway projects throughout the state.

He received his engineering training in Chicago schools and technical institutions.

At the outbreak of the war he obtained a leave from the department and was assigned to the Army Corps of Engineers on the Pan-American Highway. He later was assigned to the Trans-Persian Gulf Command and served in Iran during the construction of the military highway from the Red Sea to Russia. He was discharged at the end of the war with the rank of colonel, and returned to the highway department as chief engineer.

To keep waterway open for Chicago fuel supply

In order to make possible continuing shipments of fuel to the Chicago area in the expected critical shortage, plans have been made for keeping the Illinois Waterway open for navigation as long as possible this winter season.

Agreement has been made between the Inland Waterways Corp. and the Corps of Engineers whereby the corporation will use all available equipment to keep the waterway open from the mouth of the Illinois River to Chicago and the Mississippi River from the Illinois to Lock and Dam No. 26.

Actual ice breaking operations will be carried on by the corporation's Federal Barge Lines and the Coast Guard, using tow boats and ice plows.

Lt. Gen. R. A. Wheeler, Chief of Engineers, has directed that locks in the upper Mississippi between St. Louis and St. Paul and Minneapolis remain in operation to handle river traffic as long as ice breaking activities continue and shippers use the waterway.

MAJOR MEETINGS

American Society of Civil Engineers, annual meeting, Hotel Commodore, New York, N. Y., Jan. 21-24, 1948.

Canadian Construction Association, 30th annual meeting, Chateau Frontenac, Quebec, Que., Jan. 25-28.

American Road Builders' Association, and its Divisions, annual meeting, Willard, Mayflower and Statler Hotels, Washington, D. C., Jan. 26-28.

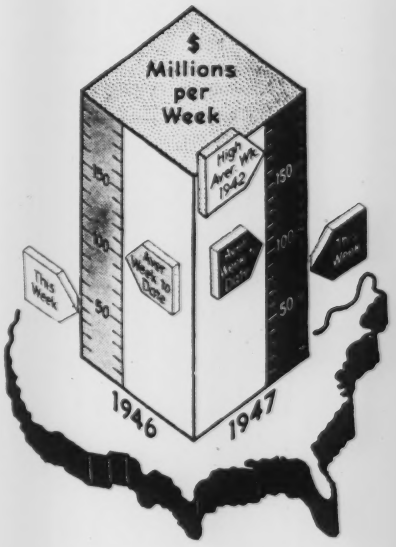
Associated General Contractors of America, Inc., 29th annual convention, Dallas, Tex., Feb. 9-12.

Associated Equipment Distributors, 29th annual meeting, Chicago, Ill., Feb. 15-19.

U. S. Conference of Mayors, annual conference, Waldorf-Astoria Hotel, New York, N. Y., Feb. 16-18.

American Concrete Institute, annual convention, Shirley-Savoy Hotel, Denver, Colo., Feb. 23-26.

CONSTRUCTION ACTIVITY



As Reported this week to...
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only
(Thousands of Dollars)

	Week of Dec. 25 1947	Cumulative 1947 (52 wks.)	Cumulative 1946 (52 wks.)
Federal	$8,540	$656,419	$599,271
State & Mun.	18,837	1,835,012	1,419,092
Total Public	$27,377	$2,491,431	$2,018,363
Total Private	36,231	3,167,801	3,157,671
U. S. Total	**$63,608**	**$5,659,232**	**$5,176,034**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1947 (52 wks.)	Cumulative 1946 (52 wks.)
Waterworks	$407	$139,141	$109,159
Sewerage	462	174,764	113,589
Bridges	2,018	196,297	128,671
Highways	7,588	794,133	769,387
Earthwork, Waterways	592	326,856	327,605
Buildings, Public	13,743	615,492	414,087
Industrial	4,229	862,265	1,113,251
Commercial	31,022	1,897,961	1,846,173
Unclassified	3,547	652,383	354,112

NOTE: Minimum size projects included are: Waterworks and waterway projects, $28,000; other public works, $50,000; industrial buildings, $68,000; other buildings, $250,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1947 (52 wks.)	Cumulative 1946 (52 wks.)
NON-FEDERAL	Current	$1,734,699
Corporate Securities	Figures	661,558
State and Municipal	Not	848,141
Fed. Aid Highway	Available	225,000
FEDERAL		1,714,695
Total Capital		**$3,449,394**

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Dec.'47	432.30	207.81
Building Cost	Dec.'47	325.27	175.83
Volume	Nov.'47	238	194

EDITORIALS

VOLUME 139 NUMBER 26

December 25, 1947

Be of Good Cheer

IN THIS LAST WEEK of a year that has been unusually good to engineers and construction men it is proper to pause and appreciate the fact. Despite shortages and high prices, it has been possible to keep the nation's physical plant operating at a high rate, and even to improve and add to it. Satisfaction with a job well done is heightened by the knowledge of continuing need for the services of the engineer and by increasing confidence in his abilities by the general public. Challenging problems whose solution will benefit mankind promise a worthwhile future, while full employment at high wages lend a presumption of success. It is, therefore, that the admonition of Christmas, "Be of Good Cheer", has a special applicability to the readers and the editors of this journal. And if in the enjoyment of our privilege we can at some time be humble in its acceptance and honest in its use, the great objective of Peace, Goodwill Toward Men can come closer to attainment.

Best Housing Report

WITH EVERYONE taking a crack at the shortcomings of the housing construction industry, it has remained for the National Association of Manufacturers to come forward with the most pointed and complete analysis yet of the troubles, foibles and malpractice of this vital element of our economy. The appeal of the report rests in its obvious objectivity and avoidance of singling out a lone culprit to be drawn and quartered. The trouble with housing construction resides in restrictions, says the NAM, and everyone has a share in the blame, including its own members. They perpetuate expensive distribution methods, and they attempt to fence off and control markets. Labor featherbeds jobs, opposes labor-saving methods, engages in jurisdictional and boycotting strikes. Public officials procrastinate on building code revision. State legislatures ignore practices that are illegal in interstate commerce. These are some of the troubles that the report emphasizes, but it also suggests remedies. Reported in our issue of Dec. 12, 1947, vol. p. 781, they are worth reading and pondering. They reflect housing construction analysis at its best.

Swimming Pool Design

INCREASING INTEREST in municipal recreational facilities focuses attention on the need for better engineered design of proposed and remodeled swimming pools. Too often expert guidance is not sought on the premise that a swimming pool is simply a tank fitted with machinery for changing the water and supplying chlorine. That such a supposition is erroneous is borne out by an article in this issue. Essential requirements for sound swimming-pool design are pointed out along with pertinent advice on site selection and operating procedures. And hope is held out to those municipalities that have inherited obsolete pools: if the location is correct and the structure sound, rehabilitation may be practical. But in both original design and in remodelling, it is clearly evident that specialist information is a pre-requisite to this type of work.

Precedent for Pollution Control

THERE ARE TWO SCHOOLS of thought in regard to stream pollution abatement. One holds to the extreme view that any discharges from municipal or industrial sewers should be treated to pristine purity. The other claims it is uneconomic to purify liquid wastes beyond the point required to keep a stream in good condition. Strong legal support has now been given to the latter philosophy in a decree handed down in a Maine court. (*ENR*, Dec. 18, 1947 vol. p. 842.) Based on the testimony of an expert sanitary engineer, E. Sherman Chase of Boston, the court went further to define what these conditions should be and how they are to be met. The decision is proper acknowledgment that pollution abatement is subject to engineering interpretation, and that treatment measures may be tailored to meet local needs.

Truck Damage to Highways

A STUDY of great importance to all state highway departments is to start soon in Pennsylvania under the auspices of the Highway Research Board. It will be an attempt to determine the relation between truck operating costs and gross truck load or axle load. Cooperating organizations include the Public

Roads Administration, the American Association of State Highway Officials and the American Trucking Associations, Inc., hence it is to be assumed that every effort will be made to produce results that will be beyond challenge even though they may not be palatable to all concerned.

Few subjects in the field of highway transportation are as controversial as that of the extent to which heavy trucks damage highways. Truck operators hold that trucks heavier than now permitted in most states could be operated without serious injury to the highway pavements, while highway engineers maintain that the damage done by trucks loaded in excess of legal limits is all out of proportion to any advantage to the truck operators. At the moment the weight of evidence appears to be on the side of the highway officials, but much of it is circumstantial.

Evidence pointing to the destructive effect of overloaded trucks came out in several of the discussions at the recent meeting of the Highway Research Board in Washington. Especially convincing was that developed in Indiana where a sharp rise in pavement pumping was found to coincide closely with a rise in the movement of trucks loaded in excess of the legal limits. It was found also that pumping bears no relation to age of pavement, hence the rise in pumping cannot be charged to failure to replace old surfacing.

The Pennsylvania studies will not dispose of all the questions that should be answered, but they should show what truck operators may save by operating trucks loaded somewhat in excess of the legal limit. Highway officials are confident that these savings are microscopic in relation to the cost of building highways adequate to carry those higher loads. If they are right, the highway departments will have ample justification for taking drastic steps to end the operation of overloaded trucks. They now lack such justification.

Yet to be answered, of course, are the questions of what types of pavement are adequate to carry the current legal limits indefinitely, and what thickness of pavements would be required to carry moderate increases in truck weights if the Pennsylvania tests should show that to be economical. Such questions should be answered soon, even though costly test track operations are required. And they should be undertaken regardless of what is learned from the Pennsylvania tests because it is obvious that truck organizations will continue to press for higher load limits.

Imaginative Engineering

AIRPORTS need not be a heavy drain on a city's financial resources if imaginative engineering and operation are applied to them, according to James C. Buckley, director of airport development for the Port of New York Authority. Mr. Buckley made this statement at a recent meeting of the Metropolitan Section, ASCE, at which he pointed out how necessary it is for the port authority to make the airports that it recently took over self-supporting. As the authority lacks taxing powers, it must be able to demonstrate that the airports will produce enough income to carry the bonds issued to finance work on them. Hence the need for vision in both design and operation.

Imaginative engineering, in Mr. Buckley's opinion, is the type of engineering that does not just design to meet the needs of today, but undertakes to foresee what future needs may be, and builds to avoid obsolesence or costly changes in the future. Imaginative operation visualizes ways for cutting operating costs, and means for obtaining extra income from concessions that will take full advantage of the purchasing power of those who come to the airport—passengers, employees and casual visitors. The port authority staff believes that a combination of these talents, with skill in developing an air-traffic control system, will turn the major air terminals of the New York region from liabilities to assets.

But imaginative engineering need not be limited to a new field like airport design. It can and should be applied to all fields of activity. And while it is true that a relatively new field of engineering activity like airport design gives greater scope for an imaginative approach to design problems, great credit should be accorded to the engineer who takes such an approach to older problems like the design of a water-purification system or the redesign of a railroad terminal. Such an approach can only be taken successfully by men who have kept themselves informed concerning all new methods, materials and equipment that have been developed in their particular field of activity.

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Fig. 1. Soil-cement lining for irrigation canal is placed by tractor-drawn spreader, which is fed by travelling mixing plant.

Soil-Cement Lining Placed Mechanically

W. S. Byrne
Construction Engineer
Bureau of Reclamation, Altus, Okla.

W. G. Holtz
Head, Earth Materials Laboratory
Bureau of Reclamation, Denver, Colo.

***Editor's Note**—In its efforts to reduce the cost of canal lining for irrigation projects, the Bureau of Reclamation has carried on much experimentation. Most recently machine methods of mixing and placing plastic soil-cement by means of a traveling plant were tested in Oklahoma. The continuous mechanical process cut costs to a level that opens up promising possibilities for large-scale application of the procedure.*

A ¾-MILE SECTION of irrigation canal on the W. C. Austin project in southwestern Oklahoma has been lined with plastic soil-cement in a single, continuous mixing and placing operation using mechanized equipment. Although the work was experimental in nature and was directed largely toward the development of methods and equipment, the results demonstrate that under certain conditions a plastic mix of soil-cement can be mechanically placed in canals with rapidity and efficiency. Further, the experiment indicates that, with prospective improvements and adaptations in the type of equipment used, large-scale canal lining operations utilizing plastic soil-cement are a definite possibility.

The experiment, conducted near the city of Altus, Okla., is a part of the extensive lower-cost canal lining program of the Bureau of Reclamation, aimed at reducing lining costs by means of improved methods and materials. Despite excessive seepage losses of urgently needed water, many miles of irrigation canals in the western United States are presently unlined because of the high cost of such installations (*ENR* Feb. 6, 1947, vol. p. 192). The 60,000-acre W. C. Austin project, which has more than 300 miles of canals and laterals, was the site of an earlier experiment in the comprehensive program.

This previous experiment, directed more specifically to determining the suitability of soil-cement as canal lining material (*ENR* Mar. 21, 1946, vol. p. 410), was preliminary to the work recently completed. The installation made at that time, a little more than two years ago, consisted of two short sections of lining of different types. One of these was placed with relatively dry mixes of soil-cement compacted by rollers operating up and down the canal slopes. The other section was lined with a plastic mix of soil, cement and water, placed by hand methods, with the mixing performed in a concrete mixer. Replacement of the latter procedure with faster, more economical, mechanized methods was recognized to be the next logical step in the development of plastic soil-cement lining operations for canals.

DATA ON LINED LATERAL SECTION

Bottom width	4.0 ft.
Side slopes	1 on 1½
Water depth	2.0 ft.
Area of section	14.0 sq. ft.
Capacity	44.5 cfs.
Height of lining (vertical)	3.0 ft.
Thickness of lining	3.0 ft.

New methods speed work

For the canal lining experiment recently completed, a 4,000-ft. section was chosen in a part of the project distribution system designated as the West 11.5 Lateral. This section is in pervious, sandy soil where the absence of a lining would result in

excessive water loss and bank erosion. Dimensions and capacity of the lined lateral section are given in the accompanying table.

To mix and place the soil-cement, the operation employed two machines, an 18-ft. long traveling slip-form having the patent name, Ekenstam Canal Paver, and a Barber-Greene Model 848 traveling pugmill mixer-plant. The slip-form was drawn along the canal at first by winch lines and later by tractors. Soil and cement were windrowed on the canal berm and were picked up by the traveling plant as it moved along the canal. A conveyor belt discharge transported the mix from the plant to the hopper of the slip-form. Water for mixing, for wetting the windrow and subgrade, and for other purposes was hauled to the site by truck.

Plastic soil-cement was placed at a maximum rate of 351 lin. ft. per hour, and the best continuous run was 1,375 lin. ft., or 2,292 sq. yd., in 4 hr., 40 min. With certain improvements over the experimental installation, it is believed the equipment could place more than 3,000 sq. yd. of 3-in. lining per day. Total unit costs, excluding cement, taken over a four-day period in which about 5,800 sq. yd. of lining was placed, averaged $0.52 per sq. yd. The experiment indicated that this cost can be reduced substantially in larger-scale operations.

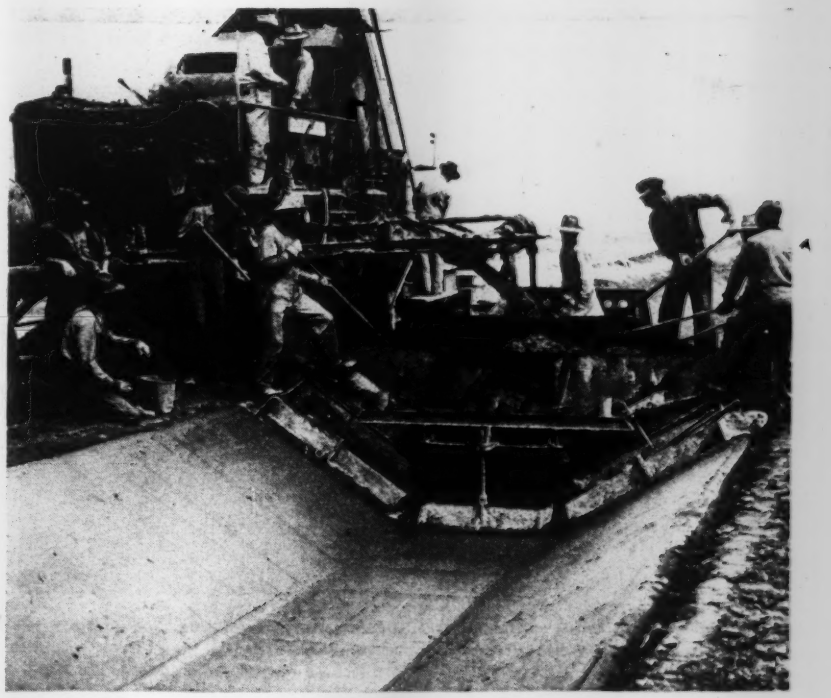

Fig. 2. Coordinated traveling plant made up of mobile mixer unit and sliding canal paver places 3-in. soil-cement lining in irrigation lateral.

Designing soil-cement mixes

Plastic soil-cement mixtures are subject to the same laboratory tests as standard soil-cement mixes, and criteria established by the Portland Cement Association for producing soil-cement of satisfactory hardness, durability, and serviceability were used in the design of the mix. The high moisture content required for plasticity caused a decrease in density and durability and called for an increase in cement content, over that required for standard mixtures, to provide equivalent durability.

Cement content required to stabilize plastic mixture of the soils from the W.11.5 Lateral was determined by tests conducted in the Denver laboratory on four samples of representative soils. These soils, which contained from 14 to 35 percent of silt and clay, were classified as fine sand, silty sand and sandy loam. They came within the A-2 soil group of the Public Roads Administration classification. The PRA method of classification, which depends upon the capacity of soils to support wheel loads, is based actually upon five characteristics of soils: cohesion, internal friction, compressibility, elasticity, and capillarity. Although use of soil-cement for canal lining is relatively new and is still considered to be in an experimental stage, these soil characteristics have been found to bear relationship to the durability of the soil-cement mixtures used for linings.

Wet-dry and freeze-thaw specimens containing 6, 10, 12, and 14 percent cement, by volume, and one volume-change specimen containing 12 percent cement were molded from each of the four samples. The average density and moisture content of the plastic mixes were 104.9 lb. per cu. ft. and 20.8 percent, respectively.

On the basis of these tests and the established criteria, 11 percent cement by volume was found to provide a satisfactory plastic field mix. Permeability tests made on plastic mixes containing 11 percent cement indicated that the mixture was impervious. Because additional experimental information was desired for canal-lining installations, it was recommended that the W.11.5 Lateral be constructed using 11.1, 16.7, and 22.2 percent cement by volume. Thus, a field comparison was made of soil-cement containing 3, 4.5 and 6 sacks of cement per cubic yard of lining material.

Preliminary operations

Despite its experimental character the canal lining work was carried out in a practical manner, and no refinements were employed in any operation that could not be duplicated on large-scale construction. Rough excavation to within 0.5 ft. was removed by a small dragline after all cuts and fills had been made by a tractor and scraper. Waste material from the excavation was piled on the right side of the ditch, and part of it was later windrowed in the correct amount for use in the soil-cement lining.

Canal lining of the specified dimensions required 3.84 cu. ft. of soil-cement mixture per linear foot. In order to assure an ample supply of material for irregularities in the subgrade, all calculations were based on 4.0 cu. ft.

To determine the exact dimensions

Fig. 3. Soil-cement lining project tests several curing methods, including white compound and cutback asphalt.

Fig. 4. Curves are lined without making paver adjustments or taking special precautions in making the turn.

of the material to be windrowed on the lateral bank, a trial run was made for a distance of about 300 ft. A windrow was shaped by means of a motor patrol, the material contained in 1-lin. ft. was removed, and the percent of moisture and the dry weight of soil per cubic foot were determined. In this manner an average density of 80 lb. per cu. ft. was established, as well as an average end area of 5 sq. ft. for the windrow. The required cement for each linear foot was computed on the basis of these figures. Cement was dumped from sacks into a depression formed in the middle of the windrow during final shaping.

Several trial runs were made using no cement to determine the gage openings necessary between the storage bin and the pugmill of the mixer with the plant traveling at 3, 5, and 10 lin. ft. per min. Although these experiments proved valuable in establishing procedure for mixing the plastic soil-cement during the lining operations, it was readily apparent that flexible operation of the travel mixer was necessary, as the opening into the pugmill had to be varied with the moisture content of the windrow, the uniformity of progress, and irregularities in the subgrade.

The desirable moisture content for the plastic field mix averaged about 30 percent. Water was furnished by three 700-gal. water trucks hauling from a supply about 2 miles away.

Design of canal paver

For placing canal lining, the Ekenstam paver is constructed on the principle of a slip-form controlled by means of a sled which conforms to the shape of the ditch and is pulled along the bottom of the ditch by a winch line. As originally constructed, the machine was 18 ft. in length and consisted of a gasoline-powered winch mounted on the sled followed by a full-width hopper, divided into pockets by diagonal fins and equipped (at the bottom of the rear wall) with center and side screeds to strike off the lining. Attached to the rear of the screeds were three steel floats designed to give the surface of the lining a final finish. Both the screeds and the floats could be adjusted by means of turnbuckles to produce the correct thickness of lining. The machine proved to be flexible in spite of its size and weight, but considerable revision was made before it could be adapted to placing soil-cement lining.

Little time was available for preliminary experimenting with the paving machine. It was necessary to proceed with the lining immediately upon arrival of the paver. As a result, the first few operating attempts were unsuccessful. In these first trials, it became evident that uniform distribution of the mixed soil-cement to the screeds was of prime importance. Several types of hoppers were built and installed with little success.

After three days the paver was dismantled and rebuilt under the direction of the inventor. Its overall length was reduced to 15 ft., parts of the diagonal fins in the screeds were

removed, and the floats were shortened by half. The hopper was fitted with a distributor plate in the center so that the soil-cement mixture could be raked into place on the side slopes by men with mortar hoes. The remodeled paver was again placed in operation and in four days completed the remaining 3,500 ft. of paving.

Practical operating results

Operations during these four days were exceptionally smooth, considering the limited time allowed for experimenting with the two machines. No difficulty was experienced in coordinating the forward motion of the traveling plant with that of the paver, although it was found that a constant forward speed was particularly essential to successful operation of the paver.

In general, the lining, as placed, was of good quality and appearance. Some voids and irregularities were left in the surface, due chiefly to the lack of a proper feed hopper on the paver and the inefficiency of distributing the mixture by means of hand labor. Delays due to breakdown of either machine or of water and cement supply were few, but when they did occur, the soil-cement mixture in the paver stiffened and was difficult to clean out. Suggested improvements in the slip-form include a provision for raising the machine vertically in the ditch to clean it and, also, some means for making adequate joints between daily runs. External vibration on the float plates and mechanical facilities for distributing the mixture in the paver would be other logical improvements.

Curing the soil-cement lining

Several types of curing were tested to determine the most efficient method. A damp soil cover of about 1-in. thickness proved to be the most efficient and gave the best immediate results. White-pigmented curing compound, applied by means of a spray gun, furnished a good cover with a single-cost application. Other compounds used included a mixture of 30 percent paraffin with 70 percent diesel fuel, applied at 120 deg. F., and a coating of RC-2 oil, applied hot.

Some cracking was observed soon after the lining was placed, particularly in the sections of lining cured by the oil paraffin and RC-2 oil coatings. In general, most were surface cracks, and they formed a pattern which seemed to indicate that in part, at least, they were due to friction between the smoothing plates and the finished surface of the lining. As the cement content of the mixture increased and the consistency became more sticky, the cracking appeared to increase. In lieu of a damp earth cover, it is believed that white-pigmented curing compound, placed immediately following the paver, would be successful in preventing cracks due to high surface temperature.

Credit for the successful culmination of the experiment must go to several individuals and firms who provided valuable assistance in planning and carrying out the work, including Joe Casey and Ed Ekenstam, Madsen Iron Works; M. D. Catton, manager of the soil-cement bureau, and V. O. Peterson, engineer, Portland Cement Association; M. C. Miller, San Ore Construction Co., and Ashley Barber, vice president of the Barber-Greene Co.

Operations on the W. C. Austin Project are under general direction of Michael W. Straus, commissioner, Bureau of Reclamation. The project is located in Region 5, of which Howard E. Robbins is acting regional director. All construction is under the technical supervision of Walker R. Young, chief engineer, Denver.

Gas Fire in Sewer Manhole Traced to Sanitary-Fill Operation

A freak fire in which a deep sewer manhole acted in the role of a huge "Bunsen burner" was traced to the ignition of methane gas that seeped into the sewer from an adjacent sanitary fill. This incident, reported to *Engineering News-Record* by L. C. Bailey, city engineer at Knoxville, Tenn., calls attention to the potential hazards of gas generation from the decomposition of garbage in sanitary fills.

Mr. Bailey's account is as follows: The Rohm-Hass Corp. built a plant for the manufacture of Plexiglas about a half mile from the site of our sanitary fill. They obtained an easement across this site to build a 24-in. sewer, the installation taking place before the fill had been started but with prior knowledge that the sewer eventually would be covered.

For the past three years we have been filling in on this site without any apparent trouble. Last March we had several wind storms and it became necessary to completely seal the garbage-fill bottom, top and sides with clay earth.

About two weeks afterward intense heat and blue flames came pouring out of one of the manholes on the sewer line and Rohm-Hass engineers were called in for discussion, together with the gas engineer of the Knoxville Utilities Board. Many ways of putting out this fire were discussed in order to prevent a backflash into the plant, since it was thought the effluent from the plant was on fire.

However, it was finally determined that the fire was only in the top four feet of a 30-ft. manhole and it was decided that this manhole was acting as a Bunsen burner with the methane gas from the garbage fill seeping through the sides of the manhole and furnishing the fuel for the fire.

We then obtained carbon dioxide from the fire department and put this fire out quickly. There has been no further trouble but we constantly watch this manhole and others to keep any fire from the vicinity that might reignite the gas.

While Mr. Bailey's experience at Knoxville is unusual, it is not unique, so far as gasification hazards in landfill is concerned. In New York City, for example, a shanty on a landfill was demolished some years ago by an explosion resulting from seepage of gas into the shack, which was accidentally ignited. More recently, an explosion of gas occurred in a culvert adjacent to a New York fill.

At San Francisco, special control procedures have been developed to cope with fires in the fill that result from spontaneous combustion of gas. Details on this will be published soon.

What Filter Sizes Are Economical?

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***Contents in Brief**—Designers of water purification plants must solve the problem of selecting the most economic size of filter units. This involves reaching a balance between factors that favor a small number of large units and those that favor a large number of small units. From the following analysis a graph has been designed which expedites solution of this problem.*

IN DESIGN of water purification plants some filter capacity in addition to that dictated by normal operation is required to provide sufficient supply during out-of-service periods of cleaning or repair. Usually this condition is met by including one or more stand-by filters.

Economic determination of unit dimensions is affected directly by inclusion of extra filters. When total area has been determined at a safe rate of filtration, cost of plant may be decreased by providing large units. Length of partition walls and number of essential appurtenances—such as, valves and rate controllers—are reduced. On the other hand, the extra unit will cost less when more small filters are planned.

The optimum size of unit may be found by balancing the opposing cost factors so that total first cost will be a minimum. Economical dimensions may be determined with aid of a graph (Fig. 2) developed from the following analysis.

Case I Single Bank of Filters

When rectangular filters are arranged in a single row as shown in Fig. 1, cost will depend upon the following factors:

(a) Total area required to provide a suitable velocity of percolation;
(b) cost of walls; and
(c) cost of appurtenances such as rate-controller, valves, and other control devices.

If one extra filter unit is required for reserve, total cost is expressed mathematically as follows:

$$C = c_1 A + \frac{c_1 A}{n-1} + c_2(n+1)y + \frac{2c_2 nx + nF}{} \qquad (1)$$

where

C = total cost, dollars
c_1 = cost of filter bed, dollars per acre (land, sand, under drainage, etc.)
c_2 = cost of walls, dollars per lin. ft.
F = cost of appurtenances per unit, dollars
x = width of unit, ft.
y = length of unit, ft.
n = number of units
A = total area required not including the extra unit, acres
$= \frac{\text{design flow, mgd.}}{\text{rate of filtration, mgad.}}$

The three variables, n, x, and y in equation (1) are interrelated by the equation.

$$A = nxy \qquad (2)$$

Values of these variables must be chosen to satisfy equation (2) and may be chosen so that total cost will be a minimum. Optimum values of n, x, and y that minimize cost may be calculated from equation (2) and the following formulas, which were obtained by differentiation of equation (1) using the Lagrangian method of undetermined multipliers (Sokolnikoff: *Higher Mathematics for Engineers and Physicists*, McGraw-Hill):

$$\frac{c_2}{c_1 A} = \frac{\sqrt{(n^2-1)n}\,(n-1)}{\sqrt{2}\,(n^2-2n-1)} \times \left[\frac{1}{(n-1)^2} - \frac{F}{c_1 A}\right] \qquad (3)$$

$$x = \frac{n+1}{2n}\, y \qquad (4)$$

Equation (3) may be solved for n by a cut-and-try procedure or with the aid of a graph (Fig. 2, solid lines).

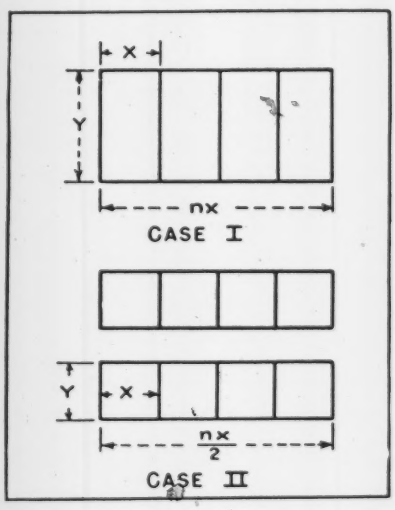

Fig. 1. Diagrammatic representation for the analysis of single and double filter bank set-ups.

Example 1: A slow sand filter is to be designed for a flow of 10 mgd. and a filtration rate of 4 mgad. Determine the number of filter units and their dimensions if cost data are as follows:

c_1 = \$160,000 per acre = \$3.67 per sq. ft.
c_2 = \$30 per ft.
F = \$10,000 per unit

The required area is computed as follows:

$$A = \frac{10}{4} = 2.5 \text{ acres} = 109{,}000 \text{ sq. ft.}$$

$$\frac{F}{c_1 A} = \frac{10{,}000}{(160{,}000)\,(2.5)} = 0.0250$$

$$\frac{c_2}{c_1\sqrt{A}} = \frac{30}{(3.67)\,\sqrt{109{,}000}} = 0.0247$$

The point on the graph, Fig. 2, corresponding to these ratios, lies closest to the solid line $n = 6$. The economical number of units is, therefore, 6. The area of each unit will be $\frac{2}{6} = 0.417$ acres, or 18,200 sq. ft. The dimensions of the individual unit may be calculated with aid of equation (4):

$$18{,}200 = xy = \frac{n+1}{2n}\, y^2 = 0.584y^2$$

Therefore, $y = 177$ ft.

$$x = \frac{7}{12}\,(177) = 103 \text{ ft.}$$

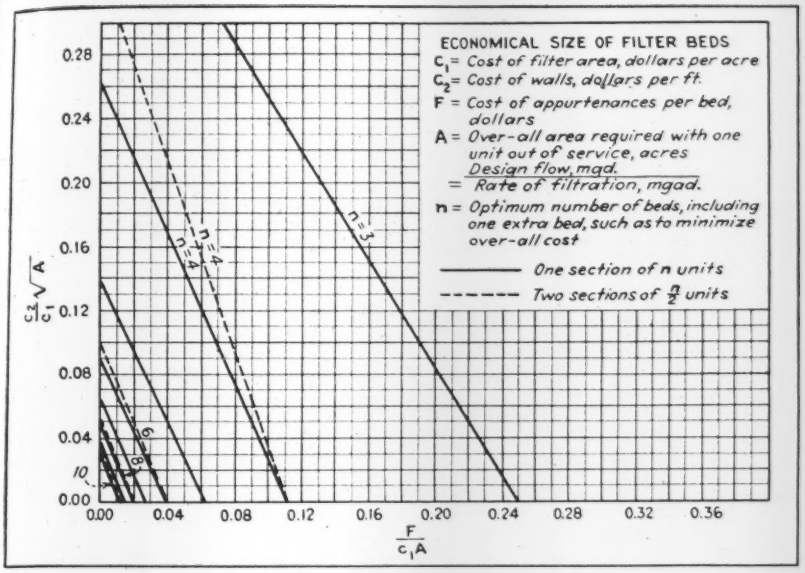

Fig. 2. By use of cost ratios the most economical number of filter units for a given condition may be found quickly.

Case II Double Bank of Filters

If filter units are arranged in two facing sections as shown in the lower half of Fig. 1, then the economical dimensions may be determined by slightly modifying the foregoing formulas.

If

n = the total number of units in both sections including one extra unit,

A = the total area required not including the extra unit, in acres, and other symbols are defined as in Case I, the total cost including one extra unit may be expressed as follows:

$$C = c_1A + \frac{c_1A}{n-1} + c_2(n+2)y + 2c_2nx + nF \quad (5)$$

The variables n, x, and y are again related as in equation (2). Optimum values of n, x, and y may be calculated from the following formulas obtained in the same manner as equations (3) and (4):

$$\frac{c_2}{c_1A} = \frac{\sqrt{n(n^2+n-2)}\,(n-1)}{\sqrt{2}\,(n^2-2n-2)} \times \left[\frac{1}{(n-1)^2} - \frac{F}{c_1A}\right] \quad (6)$$

$$x = \frac{n+2}{2n}y \quad (7)$$

Equation (6) may be solved with the aid of a graph (Fig. 2, dashed lines).

Example 2: Determine the optimum number of units and their dimensions, assuming the data of example 1 but with filters arranged in two sections. The area of each section will be

$$\frac{A}{2} = \frac{2.5}{2} = 1.25 \text{ acres} = 54{,}500 \text{ sq. ft.}$$

The cost ratios as before will be

$$\frac{F}{c_1A} = 0.0250, \text{ and } \frac{c_2}{c_1\sqrt{A}} = 0.0247.$$

Then, in Fig. 2, the point corresponding to these ratios is found to lie closest to the dashed line $n = 6$. Each section would have, therefore, 3 units. Dimensions of each unit are calculated in a manner similar to that of example (1) using equation (7). The results of the calculation are the following:

$$y = 165 \text{ ft. and } x = 110 \text{ ft.}$$

With appropriate values of the cost ratios, the foregoing formulas may be applied to rectangular filters, including both the rapid sand and the slow sand types, and to rectangular sludge-drying beds used in sewage treatment plants. In both water purification and sewage treatment plants, the formulas may be employed to give an indication of the optimum number of settling tanks and aeration basins when these units are to be rectangular and installed side by side.

In some cases,—such as, the rapid sand filter,—the formulas may have to be applied on a cut-and-try basis, since some of the cost parameters, c_1, c_2 and F, may not be independent of the size of the unit. Such is the case when wash water piping costs become a limiting factor. The procedure in this event, however, is relatively simple:

(1) Evaluate the cost parameters c_1, c_2, and F, assuming a reasonable value of the number of units, n. Then calculate n from equation (3) or (6).

(2) Revise estimates of cost parameters, using the size of unit determined in (1). Repeat if necessary.

The ultimate evaluation of the optimum number of units will be facilitated by use of Fig. 2.

Irrigation Water Supply Ample in New Mexico

Irrigation districts of New Mexico, with the exception of the Elephant Butte or Rio Grande District of southern New Mexico and Texas, are in better shape this year as regards irrigation supplies than last year.

Conchas Dam, which stores water for the Tucumcari or Arch Hurley District, held 370,381 acre-feet of water on June 1, or only 30,000 acre-feet under capacity and 20 per cent more than the 309,617 acre-feet as of the same date in 1946.

Four reservoirs on the Pecos River held 261 per cent of the water they had in 1946. The reservoirs, with the 1947 figures in acre-feet, followed by the 1946 figures: Alamogordo, 36,454, 4912; McMillan, 1390, none; Avalon, 5110, 414; Red Bluff, Texas, 45,500, 28,500.

El Vado Reservoir of the Middle Rio Grande Conservancy District, held 179,811 feet on June 1, compared with only 144,578 in 1946.

The Bluewater-Toltec reservoir is empty, as it was last year. But enough wells have been drilled so the maximum acreage of the district, 5000 acres, is under cultivation this year. Eleven wells of 20 to 22-inch casings are delivering upwards of 2000 gallons per minute each.

The Elephant Butte district has only 61 percent of the water it had last year, and the shortage is so acute that generating of hydro-electric power has been curtailed. Elephant Butte reservoir, with a capacity of 2,219,000 acre-feet, had only 467,200 in storage, compared with 899,000 a year ago. Caballo Dam with a capacity of 346,000 had 188,950, compared with 170,060 last year.

Submerged-Weir Discharge Studies

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***Contents in Brief**—Based on an application of the superposition principle and results of experimental work completed at the hydraulics laboratory of the Pennsylvania State College, where the author formerly served as an assistant professor of civil engineering, a general discharge formula for sharp-crested, submerged weirs has been developed. Results of the tests are said to prove: (1) that triangular and parabolic weirs are more accurate measuring devices than proportional and rectangular types, and (2) that sharp-crested submerged weirs can be used in practice with confidence, if certain design and operational specifications are satisfied.*

ENGINEERS HESITATE to use submerged weirs for liquid measurement and control in open channels because of lack of design and performance data. Submerged weirs conserve elevation and should have wide application in the design of gravity systems where savings in head loss mean savings in construction costs.

The amount of research concerned with submergence phenomena is small relative to its importance in hydraulic design. None of the early theories has been substantiated successfully by experimental results. For this reason, an investigation was undertaken in April 1943 at the hydraulic laboratory of The Pennsylvania State College to study the effect of submergence on weir discharge, and to develop design and performance characteristics for all common shapes of sharp-crested and broad-crested weirs.

After completing the work on the sharp-crested weirs described in Fig. 2, the investigation was interrupted in September 1943, because of war training programs. A few months after the start of these tests, J. K. Vennard and R. F. Weston (Submergence Effect on Sharp-crested Weirs, *ENR*, June 3, 1943, vol. p. 814) compared and summarized the experiments of six investigators (Bazin, Cone, Cox, Francis, and Fteley and Stearns), and presented an excellent simplification of the calculations in applying their results.

In order to derive an expression for submerged weir flow, it is necessary to make some simplifying assumptions. One such assumption was first made by Nancay Dubuat (*Principles d'Hydraulique*, vol. 1, p. 203, 1816). He considered the flow over a submerged weir to be made up of two parts: (1) a free flow with effective head equal to the difference in upstream and downstream levels; and (2) a submerged orifice flow likewise operating under a head equal to the difference in upstream and downstream levels. However, his equation has not been verified by tests of later experimenters.

As a first approximation to the proper form of submerged discharge, Q, as a function of the upstream and downstream heads h_1 and h_2 above the weir crest, a more simplifying assumption than that of Dubuat might be made. Assuming that the net flow over the weir is the difference of the free-flow discharge due to head h_1 minus the free-flow discharge due to head h_2 (Fig. 1), then,

$$Q = Q_1 - Q_2 \qquad (1)$$

This assumption implies that the head, h_2, does not directly affect the flow of water due to h_1 and likewise

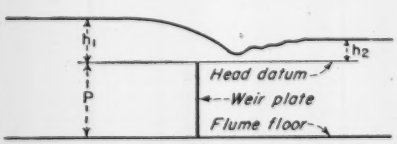


Fig. 1. Conditions affecting submerged flow are shown in this sketch.

that head, h_1, does not prohibit counterflow due to h_2. Its use is thus equivalent to an application of the principle of superposition which is frequently used in evaluating the combined effect of several independent conditions. The equation

$$\frac{Q}{Q_1} = 1 - \frac{Q_2}{Q_1} \qquad (2)$$

should not be expected to give a quantitative relation for determining Q, since interaction and other perturbing influences have been entirely neglected. These effects would probably contribute additional higher order terms in $\frac{Q_2}{Q_1}$.

The experimental tests show that $\frac{Q}{Q_1}$ is related functionally to $1 - \frac{Q_2}{Q_1}$ but that the appropriate function is not the simple linear one of equation (2). The results show that this relationship may be expressed in the form

$$\frac{Q}{Q_1} = f\left(1 - \frac{Q_2}{Q_1}\right) = k\left(1 - \frac{Q_2}{Q_1}\right)^m \qquad (3)$$

or since

$$Q_1 = C_1 h_1^{\,n1} \text{ and } Q_2 = C_2 h_2^{\,n2}$$

$$\text{then, } \frac{Q}{Q_1} = k\left(1 - \frac{C_2 h_2^{\,n2}}{C_1 h_1^{\,n1}}\right)^m \qquad (4)$$

where k and m are constants to be determined from data and the C's and n's are the coefficients and exponents that appear in the free-flow discharge equation obtained from previous calibration or by use of an appropriate standard weir formula. The values of C's and n's for the weirs tested are shown in Fig. 2.

For any given type of weir the coefficients, C_1 and C_2, and the exponents, n_1 and n_2, should be equal. Then, equation 4 reduces to

$$\frac{Q}{Q_1} = k\,(1 - S^n)^m \qquad (5)$$

where S = submergence ratio, $\frac{h_2}{h_1}$. The constant k and the exponent m, which account for the interaction effects,

were determined separately for each weir type by the algebraic method of averages. The results for the seven weir types when averaged arithmetically showed k equal to 1.00 and m equal to 0.385 for a practical submergence range of 0.00 to 0.90. The maximum variation of each from the average is less than 1 percent.

Thus, the general discharge equation for all sharp-crested weirs with crest curvatures expressed by continuous single-valued functions is

$$Q = Q_1 (1 - S^n)^{0.385} \qquad (6)$$

For all sharp-crested weirs regardless of crest curvature, the more general form of equation 3 should be used. Assuming the same constants to apply, the equation for this case is

$$Q = Q_1 \left(1 - \frac{Q_2}{Q_1}\right)^{0.385} \qquad (7)$$

WEIR NO.	DESCRIPTION	SHAPE AND SIZE	HEAD DATUM HEIGHT, P, FT	FREE FLOW DISCHARGE FORMULAS, CFS	EXPONENT USED IN COMP.	NUMBER OF TESTS
1	SYMMETRICAL PROPORTIONAL	$\frac{X}{b} = 1 - \frac{2}{\pi}\tan^{-1}\sqrt{\frac{Y}{a}}$ WHERE: a=0.03 FT. b=1.00 FT. WITH X & Y IN INCHES	1.01*	$Q_0 = 0.863\, h_0^{1.49}$*	1.00	42
2	RECTANGULAR FULL-WIDTH	3.02'	2.00	$Q_0 = 3.35 L\, h_0^{1.49}$	1.50	59
3	RECTANGULAR CONTRACTED	1.25' 0.50' 1.25'	1.00	$Q_0 = 2.96 L\, h_0^{1.44}$	1.44	38
4	RECTANGULAR CONTRACTED	1.00' 1.00' 1.00'	1.25	$Q_0 = 3.00 L\, h_0^{1.45}$	1.45	9
5	PARABOLIC	$Y = 3X^2$, IN FEET	0.83	$Q_0 = 2.04\, h_0^{1.98}$	2.00	33
6	90° TRIANGULAR	$Y = X$, IN FEET	2.00	$Q_0 = 2.54\, h_0^{2.51}$	2.50	40
7	CUSP PARABOLIC	$Y = \sqrt{25X}$, IN FEET	0.83	$Q_0 = 0.594\, h_0^{3.32}$	3.32	59
NOTE	For all weirs h_1 was measured 3.00 ft upstream from weir and h_2 6.00 ft downstream. Three piezometer holes on a transverse line in the flume floor were connected to each point gage stilling tube. *Head datum 0.010 ft above weir crest.					

Fig. 2. Seven types of weirs were tested in this series of experiments.

Experimental tests

The seven experimental weirs described in Fig. 2 were mounted in turn midway in a steel flume 3 ft. wide, 3 ft. deep, and 25 ft. long. Discharge was measured by a calibrated, standard 90 deg. triangular, sharp-crested weir placed near the upstream end of the flume, and the degree of submergence was controlled by three 6-in. vertical outlets passing through the flume floor at the down-stream end and adjustable in elevation.

The same testing procedure was used for all weirs. After calibrating each weir for free flow by comparison with the triangular weir, the discharge was held constant and the degree of submergence changed 10 to 15 times from 0.00 to about 0.95. Upstream and downstream head observations were taken for each submergence setting using point gages reading in 4-in. stilling tubes. For each type of weir the same procedure was followed using three additional constant discharge rates. Detailed observations were recorded on the behavior of the nappe and downstream flow conditions.

The experimental results show that the dimensionless terms, $\left(\frac{Q}{Q_1}\right)$ and $\left(1 - \frac{Q_2}{Q_1}\right)$, have a consistent functional relation for all sharp-crested weir types. A logarithmic plotting of simultaneous values of $\left(\frac{Q}{Q_1}\right)$ and $(1 - S^n)$ for each experimental weir (Fig. 3) shows the general conformity

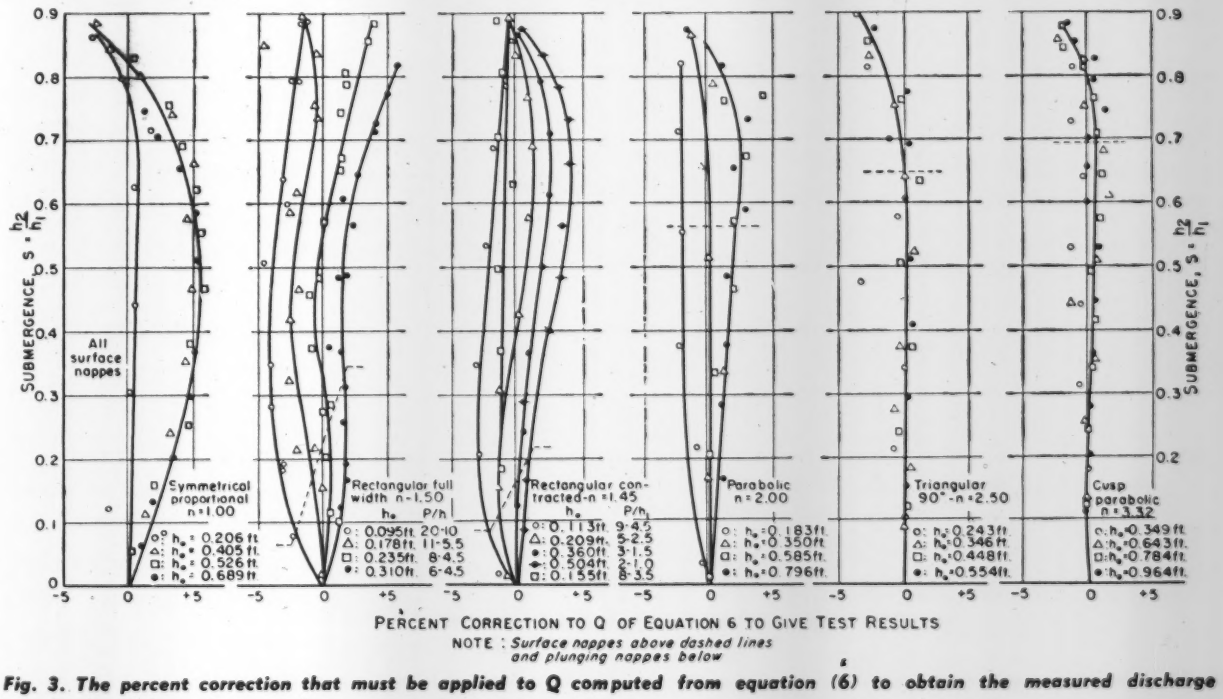

SUBMERGENCE, S = h2/h1
All surface nappes
Symmetrical proportional n=1.00
Rectangular full width n=1.50
Rectangular contracted n=1.45
Parabolic n=2.00
Triangular 90° n=2.50
Cusp parabolic n=3.32
PERCENT CORRECTION TO Q OF EQUATION 6 TO GIVE TEST RESULTS
NOTE: Surface nappes above dashed lines and plunging nappes below

Fig. 3. The percent correction that must be applied to Q computed from equation (6) to obtain the measured discharge may be found from these graphs.

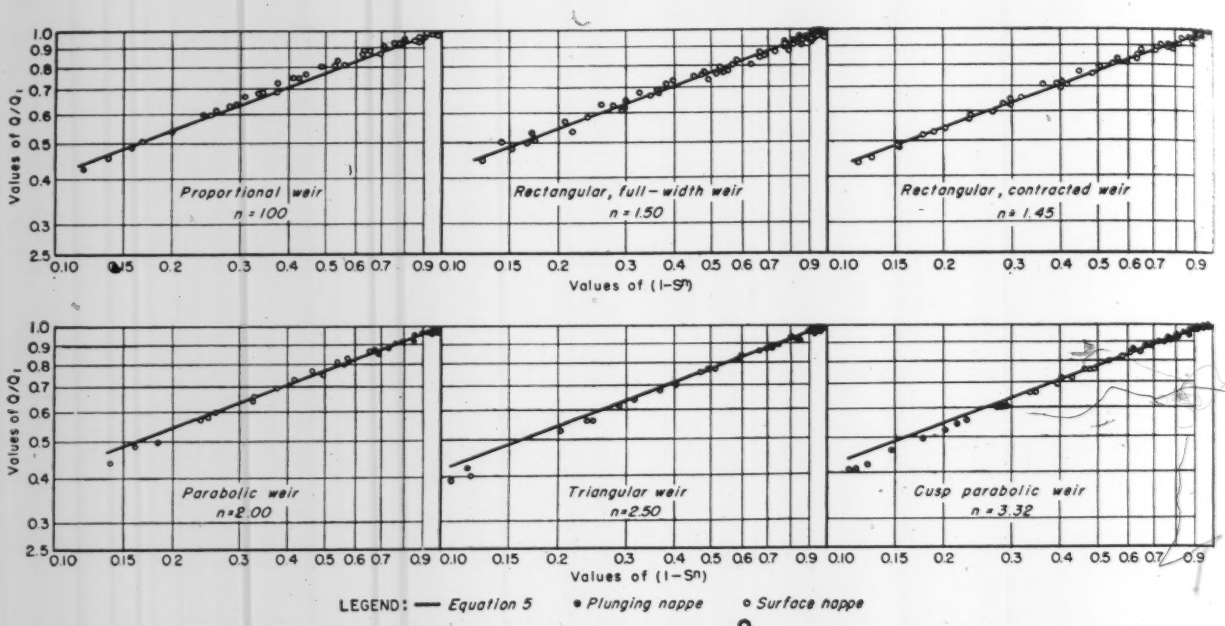


Fig. 4. Plotted on logarithmic scales, simultaneously obtained values of $\frac{Q}{Q_1}$ and $(1-S^n)$ conform closely to equation (5) with k = 100 and m = 0.385.

of all data with equation (5). The constant k and the exponent m were evaluated as 1.00 and 0.385, respectively, by methods described. It should be noted that as S increases the term $(1—S^n)$ decreases. All tests at submergences greater than 0.90 were excluded from the calculations so that the results would typify more closely practical submergence conditions.

The conformity of each test with equation (6) is illustrated in Fig. 4. The degree of submergence S is plotted against the percent correction that must be applied to Q computed by equation (6) to give the measured discharge rate. Average curves are shown for each constant discharge series, together with their ranges in $\frac{P}{h_1}$ and equivalent free flow heads, h_0. The point of transition from surface to plunging nappe conditions is also indicated.

V-notches perform best

As shown in Fig. 3, the results for weirs having top-heavy water sections are more consistent. No distinction is made among the various discharge series for the triangular and cusp parabolic weirs. However, for rectangular and proportional weirs, the variation between the low and high discharge series is about 5 percent and less for the parabolic weir.

These variations are the result of confining the nappe in narrow, shallow tailwater basins. Free circulation of the water underneath the nappe is restricted, regions of subnormal pressure are produced, and the same discharge flows through the notch at a lower h_1. This phenomenon is analogous to the operation of an unventilated free flow weir and has been explained clearly by Vennard and Weston. The rectangular, full-width weir was so erratic at low values of S and $\frac{P}{h_1}$ that tests in the two largest discharge series were excluded entirely for submergencies less than 0.10. The velocity of approach has not been considered in the computations for S and $\frac{P}{h_1}$.

Two types of nappe conditions have been identified with submerged weir discharge: (a) the plunging nappe and (b) the surface or flowing nappe. In the first the nappe plunges beneath the water surface and rises to the surface at a point downstream where some stream paths are directed upstream. In the second the nappe remains on the water surface, all stream paths are directed downstream and standing waves are developed. The transition from one nappe condition to the other is identified by a breaking of the standing wave crests similar in appearance to a hydraulic jump. This transition condition is defined as a rolling nappe.

The transition from one nappe condition to the other has little or no effect on the functional relationships when h_2 is measured just beyond the surface turbulence caused by the

TABLE I—VALUES OF $\frac{Q}{Q_1}$ FOR THREE COMMON SHARPE-CRESTED WEIR NOTCHES BY EQUATION (6), SHOWING COMPARISON WITH RESULTS OF OTHER WORKERS

Degree of Submergence S P/h1	Proportional Notch Equation (6)	Rectangular Notches Equation (6) 2–10	Cone 6	Co 4–30	Francis, Fteley, Stearns 3–10	Stevens	Bazin 6	V-Notch Equation (6)
0.10	0.96	0.99	0.99	1.00	0.99	1.00	1.00	1.00
0.20	0.92	0.96	0.96	0.96	0.96	0.97	0.97	0.99
0.30	0.87	0.93	0.93	0.92	0.92	0.93	0.93	0.98
0.40	0.82	0.89	0.89	0.88	0.88	0.89	0.89	0.96
0.50	0.77	0.85	0.85	0.83	0.83	0.84	0.84	0.93
0.60	0.70	0.79	0.79	0.77	0.77	0.78	0.79	0.88
0.70	0.63	0.71	0.71	0.70	0.69	0.70	0.72	0.82
0.80	0.54	0.62	0.62	0.60	0.59	0.59	0.63	0.72
0.90	0.41	0.48	0.46	0.45	0.45	0.51	0.48	0.57

nappe (Fig. 2 and 3). For these studies this point was found to be 6.0 ft. downstream from the weir. The best point for a particular weir must be determined experimentally. In general, the point will move farther downstream as the rate of discharge increases.

The shape of the water-section has an interesting and logical effect on the occurrence of a nappe condition. The proportional weir, which has a bottom-heavy water-section, had surface nappes for all tests. More of the water mass is under a higher head which produces a flatter curvature of the nappe underside. The stream paths of the nappe are no nearly horizontal that a plunging condition never develops. However, the nappe, plunged during low submergences for all other weirs. For any one weir the plunging condition persists for a greater submergence range as Q is increased (see dashed lines of Fig. 3). As n increases from 1 to 7/2, the water-section changes from the bottom-heavy proportional type to the top-heavy cusp parabolic type Fig. 2. Under the latter condition more of the water mass is under a lower head, the nappe trajectory has a steeper downward slope, and the plunging condition persists for greater submergences (Fig. 2 & 3).

Comparisons and conclusions

Results agree favorably with those of earlier workers. Values of $\left(\frac{Q}{Q_1}\right)$ found by equation (6) are compared in Table I with a summary of existing data on rectangular notches, compiled by Vennard and Weston and Stevens (Stevens, J. C., "Sharp-Crested Weir Flows," *ENR*, July 29, 1943, vol. p. 187). Also values of $\left(\frac{Q}{Q_1}\right)$ for two other types of sharp-crested weirs are given.

As a result of this study, the following conclusions may be drawn:

1. The experimental work indicates that $\left(\frac{Q}{Q_1}\right)$ and $\left(1-\frac{Q_2}{Q_1}\right)$ have the same functional relationship for each weir tested. In addition, it is reasonable to expect that this relationship should be applicable to the general group of sharp-crested weirs.

2. The effect of submergence on weir discharge decreases as n increases, but the stability and consistency of such effect are improved as n increases. Therefore, triangular and parabolic weirs, are more accurate when submerged than are proportional and rectangular weirs.

3. Recommendations for practical application of equations (6) and (7) are:

(a) Measure h_2 just beyond the surface turbulence caused by the nappe, generally 6 to 10 ft. downstream from the weir.

(b) Measure h_1 at least $4h_1$ upstream.

(c) For proportional weirs about 5 percent accuracy can be expected if $\frac{P}{h_1}$ is greater than 1; for rectangular weirs 3 percent if $\frac{P}{h_1}$ is greater than 3, and for fully contracted triangular and parabolic weirs less than 2 percent.

(d) The velocity of approach can be neglected in computing S *and* $\frac{P}{h_1}$.

4. The accuracy of submerged weirs will be improved if the tail-water basin is sufficiently wide and deep to permit free circulation of the water underneath the nappe. In this way, interaction effects are stabilized.

5. An application of the principle of superposition might be valuable in studying the effect of submergence on other hydraulic structures—such as, orifices, slide gates and culverts.

Throughout the testing program, valuable suggestions and assistance were received from F. T. Mavis, formerly head of the Civil Engineering Department of the Pennsylvania State College; and from J. A. Sauer, head of the Engineering Mechanics Department.

The work is now being extended by the writer in graduate study at the University of Wisconsin. It will include a broad study of submergence phenomena downstream from the weir and testing of a series of different sharp-crested weirs. Moreover, submergence tests will be conducted on broad-crested weirs, orifices, sluice gates and culverts. J. G. Woodburn, Professor of Hydraulic Engineering, University of Wisconsin who is in charge of the program, has been most helpful in the preparation of this paper.

Parking Lots Located Within City Blocks

Cities everywhere are bucking acute parking problems but so far few have put in use some of the most convenient and economical space generally available—the cluttered areas behind buildings, inside blocks.

This statement by the American Society of Planning Officials highlights recent studies done on interior-block parking and is substantiated by cities which have used this method to help meet downtown parking needs.

Quincy, Mass.; Garden City, N. Y. and Kalamazoo, Mich. operate parking lots in the center of business block, utilizing land valued at lower rates than land fronting on streets.

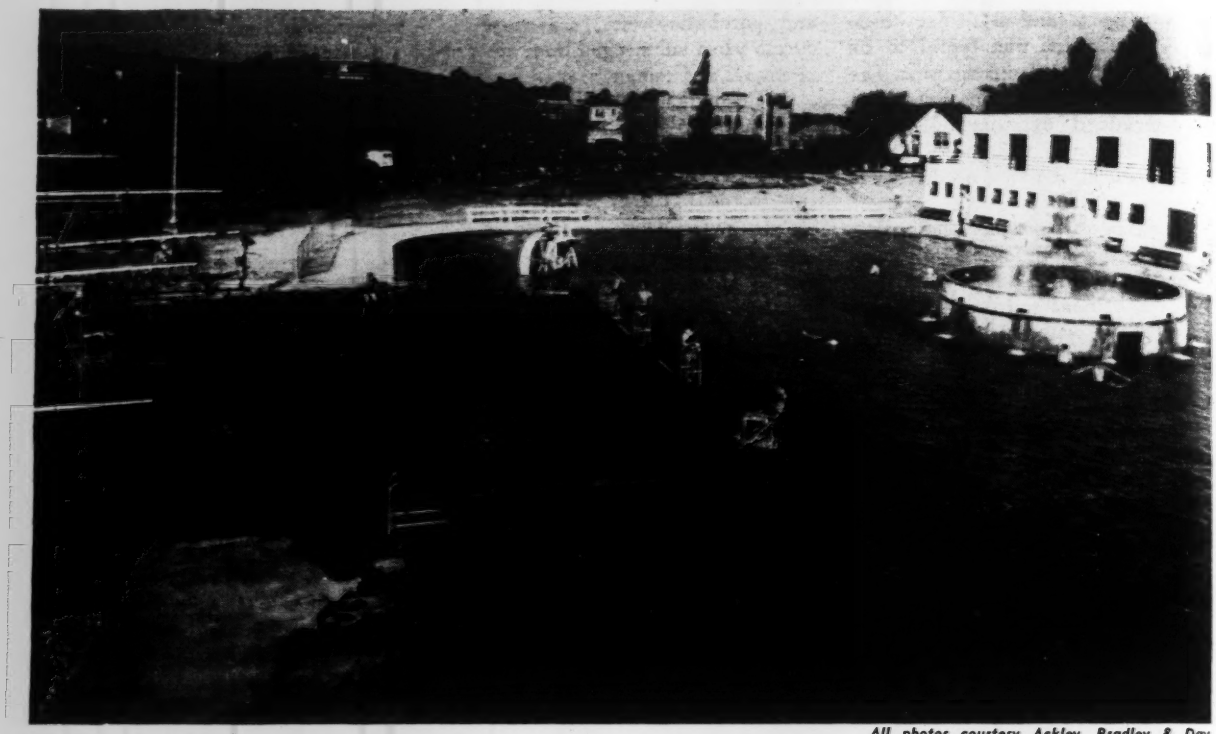
Land for the 1,200 ft. lot in Quincy cost about $150,000 and was acquired by condemnation of property lying between railroad tracks and stores.

Kalamazoo financed its interior block parking lot with an assessment against a special benefit district. In Garden City about 800 cars can be parked in the city's eight paved and landscaped interior block lots.

The Yale University traffic bureau has conducted a study showing the feasibility of low-cost parking in downtown New Haven if block interiors are used. Land valuations are $21 less per sq. ft. for interior property, in one sample block, than for street-front property. Officials estimate that 100 cars could be parked inside the block for nearly $500,000 less than in a street-front lot.

Similar developments in the West include the rear-parking area provided by store owners in a privately-controlled development along Wilshire boulevard in Los Angeles. In Oakland, the planning commission has proposed to build 16 groundlevel parking lots on the edge of the business district, some within blocks.

The Oakland parking plan involves cost estimates of $3.1 million for acquiring the land and building facilities for 6,138 auto spaces. The Anaheim, Cal., planning commission also includes interior block parking in its city masterplan.



All photos courtesy Ackley, Bradley & Day.

Fig. 1. Carlins Park swimming pool in Baltimore, Md. typifies good contemporary rectangular-pool design with separated diving basin. Large illuminated multicolor fountain aerator is an added park feature at night.

Engineered Design of Swimming Pools

Contents in Brief—When expert advice is not obtained at the time a swimming pool is designed, the result is apt to be disastrous. In one instance, the owner of a pool lost a $120,000 investment because public health standards could not be met with the plant he designed. In planning a pool, many factors must be considered. Some of the more important considerations—such as, patrons' habits, ratio of water to deck area, pool location in relation to population served, bathhouse facilities, site selection, and water purification practices are discussed in this article.

OBSOLESCENCE is the ghost that hunts the owners of a vast number of swimming pools today, both public and private. The popular conception that a swimming pool need be only a concrete-lined hole in the ground, fed continuously, or refilled occasionally with water from an approved source of supply, is pure fallacy. Such reasoning all too often has resulted in a complete underestimation of the problem at hand, with the end product being an expensive swimming pool, that was inadequate and obsolete the day it was completed.

A typical case in point is that of a medium sized city in western Pennsylvania in which, several years ago, a private individual built a bathing facility to be operated on a concession basis. All offers of engineering counsel and design plans were refused by the concessionaire-owner, who became his own general contractor on the misconceived grounds that the state engineers or any consultants engaged to prepare plans and specifications would use undue influence to incorporate special equipment deemed unnecessary by him. State law at that time did not provide any effective control in such cases.

As constructed, this bathing facility included a group of three large concrete-lined pools separated by concrete dividing walls, and offering a totally inadequate marginal area for patrons not wishing to enter the pools, or trying to emerge from them. The source of water was a natural stream, with a pumping system designed to change the water in the pool daily.

Water source polluted

This source of water, as is often the case in industrial areas, eventually proved to be unsuitable and unsafe for bathing. In addition, the daily change of water was deemed impractical, so the operator decided to change it only once a week, or as he saw fit.

Even on the basis of a daily change of water, no provisions were made, or could be made, to maintain proper

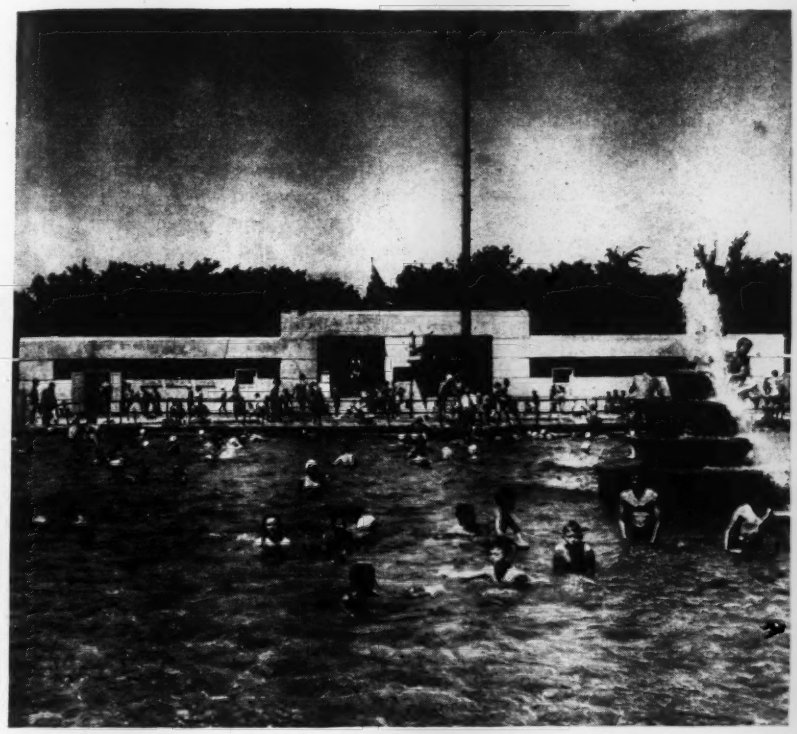


Fig. 2. Bathhouse of good architectural design forms a pleasing backdrop for ovoid swimming pool at Saginaw, Mich. This pool is equipped with underlighting in the diving section and overhead nightlighting from an island mast.

chlorine residual in the water by recirculation or otherwise—thus each patron was risking the possibility that a typhoid or dysentery carrier had just preceded him in the pool, with no safety-block between himself and the carrier.

The upshot of the entire deal was that the Pennsylvania State Health Department, under a new law, condemned the pools for public use; the owner lost most of the $120,000 cost of construction; the site, which is on valuable park land, was acquired by the city; and the park commission now is confronted with the problem of modernizing the pools that were so badly conceived. At the time this installation was completed, a properly designed swimming pool equipped with all essential appurtenances and large enough to serve this community of 35,000 people could have been built for $80,000, with good planning. Today it will cost an estimated $42,000 to rehabilitate the pools to minimum acceptable standards.

Everybody loses in such a case. The concessionaire lost his investment, the city will lose on account of the present high cost of remodeling, and the local public has lost the use of a safe and suitable place to swim during these current years, and still continues to lose.

Trends in patrons' habits

Changing habits of the patron throughout the past several years have noticeably affected the trend in swimming pool design. For example, twenty years ago 30 to 40 percent of the daily attendance at public pools occurred after 6 p.m. Today, we find less than ten percent attendance after 6 p.m., with many pools closing as early as 7 p.m. From this, it is obvious that less emphasis need be placed on night lighting of pools, except for ornamental display.

Shorter working hours, the adoption of daylight saving time, together with relief from heat offered by the almost universal application of air-conditioning in movie theaters are the chief contributing factors to reduced attendance at swimming pools during the evening.

By studying the habits of the patrons, and the needs of the community, the swimming pool designer today is equipped to provide adequate facilities while at the same time avoiding the construction of over-sized installations that are expensive and monumental rather than efficient of operation.

In the average city, ten percent of the population are potential patrons of bathing establishments on a peak summer day. However, from 75 to 80 percent of the patrons will be found out of the water at any time an observation and count is made. These people find swimming an arduous exercise, and between plunges and swims they are resting or loafing on the decks. There are some, in fact, who choose to visit the swimming pool area as an excuse to don scanty attire for the primary purpose of sunbathing and recreation. From this, it can be concluded that the marginal area should be from three to four times the pool area, or at least that ratio of people will require space out of the water, and provision should be made for them.

Pools operated 14 hrs. per day

The average swimmer will remain in the pool slightly less than two hours, and the peak hour for most pools is from 3 to 4 p.m. Even on peak days, few pools find it necessary to operate longer than 14 hours.

Geographical location and competing bathing facilities obviously are important factors in determining the size of swimming pool facilities required. These and lesser factors must be taken into account in the preliminary design.

Based on the above observations of bathers' habits, a typical town of 35,000 population could be expected to have some 3,500 swimming pool patrons during a peak day. Of this number, 830 could be expected to be in the pool during the peak hour, which would require a pool having a water area measuring about 75x165 ft. Also, it is commonly assumed that bathhouse facilities for such a pool should be designed to accommodate 830 persons at one time.

For purposes of estimating the costs of municipal swimming pool construction, it can be broken down into three divisions. They are (1) the swimming pool basin and surrounding sunbathing area; (2) the water supply and purification system complete with approved operating equipment; and (3) a substantial but plain

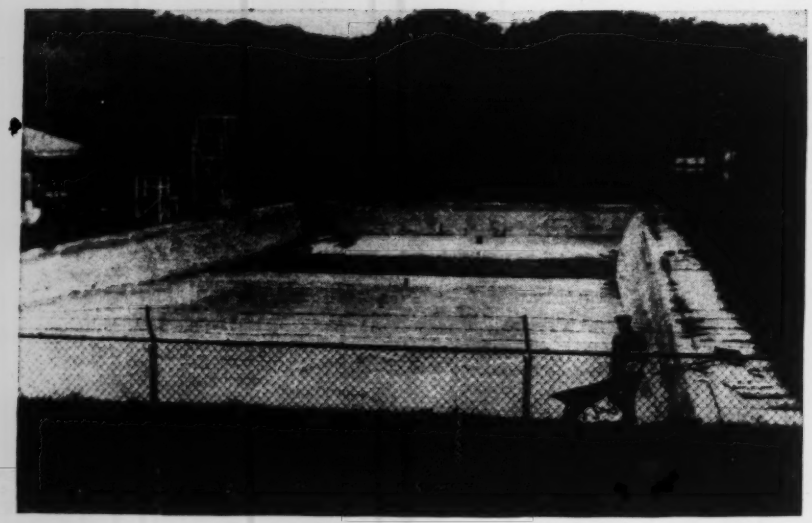


Fig. 3. Outmoded swimming pool at Rolling Green Park near Sunbury, Pa., (at top) was converted into a popular bathing facility (at bottom). Fountain aerator, which is an important link in the cycle of water purification, also presents convincing argument to patrons that water is being circulated.

bathhouse establishment complete with all essential appurtenances. For the average installation these three divisions will be about equal in cost of construction.

Selecting the site

Selection of the site for a swimming pool often is conceived in error on the fallacious assumption that a natural depression will lessen the cost by reducing the amount of excavation. Actually, such a site often increases the cost of drainage out of all proportion. Moreover, there may be severe frost damage to the pool structure during cold weather. In these days of highly developed excavating equipment, the problems of excavation are a minor item in the total cost of the job, and are becoming less important —thus a high, dry, stable site usually offers the best location.

Another extreme which should be avoided in selecting the site for a swimming pool, is a hilltop subjected to strong winds—a cold bather is quick to show his displeasure at such an improperly chosen site.

Moreover, wooded areas make poor swimming pool sites primarily because full sun on the pool as well as on the surrounding marginal area is highly desirable from every standpoint. In addition, chlorophyll and other forms of coloring from leaves and bugs dropping into a pool impart objectionable color to the water that cannot be removed by filtration, but can be reduced only by chlorine bleaching. The objection to the leaves, twigs and bugs is obvious.

In larger cities it has been found that two or more medium sized swimming pools well located and easily accessible from centers of population are much better investments than a single large pool built in the interest of a monumental facility rather than providing maximum service.

Construction of one big plant, in a large metropolitan area, immediately creates problems in transportation to and from the pool, and increases the hazards of children crossing and recrossing the city daily. In the final analysis, the swimming pool that is conceived and developed as a neighborhood facility is the more popular one.

As a point of economy, a swimming pool installation should be designed to utilize local materials to the fullest extent. It need not include major items of special design, except a few that can be secured from manufacturers who specialize in that field.

Good operating practice

In any swimming pool, either public or private, the most important features from a health standpoint are cleanliness, filtration, chlorination, recirculation and competent operation. It is essential that all water be filtered and returned to the pool during the hours of active use, and not spread out over too long a period. Although many state health departments require complete recirculation of the water every eight hours, it is believed that a six-hour period is even better.

Extensive experiments have shown that a filtration plant operated at night when the swimming pool is not in use is only partly effective because of the inadequate removal of the heavy particles in suspension.

Filtration during the night when the water is quiescent removes only 22 percent of such suspended matter in the entire pool, while the same filtration effort during active hours will remove 75 percent of the suspended matter. This phenomenon is attribu-

ted to the fact that during active use of the pool, the heavier particles are kept in motion and floated to the filtration plant. When the pool is inactive, the material settles on the bottom and goes into suspension again the next day.

As a general rule, the filtration plant of a swimming pool should be oversize rather than undersize. In no case should the filtering rate exceed 3-gal. per sq.ft. of filter area per minute. For example, a pool 75x165 ft., containing 500,000 gal. of water should have a filtration plant with a capacity of 1,400 g.p.m., having a filter area of at least 468 sq.ft., to be operated at the 3-gal. rate per sq.ft. per minute.

The chlorinating unit also should be oversize insofar as total feed in 24 hr. is concerned. It not only must be capable of stepping up the rate of feed into the recirculation system to meet the daily peak load, but it also must be able to compensate for the excessive release of chlorine caused by actinic rays of the sun, during certain atmospheric conditions.

An adequate recirculation system is of primary importance to insure distribution of the filtered, sterilized and chlorinated water uniformly throughout the pool at all times. A non-circulation system invariably results in excess chlorine at the pool intake, with diminishing chlorine content across the pool and none at the outlet.

Alkaline balance essential

Maintaining a balanced alkaline condition in the pool water is of considerable more importance than many operators think. The alum coagulant ordinarily used will "floc" satisfactorily only in an alkaline water to form the necessary coating on the filter beds.

An acid water is favorable for the growth of algae and certain types of bacteria present in swimming pools. Moreover, it may irritate the eyes and even the skin of some people, resulting in complaints to the management that there is "too much chlorine" in the pool. In reality, a residual of 0.5 to 0.7 p.p.m. of chlorine should not irritate the eyes of a normal person providing the water is alkaline and shows a reading on the pH scale of 8.2 or slightly less.

In general, the American public demands warmer water in which to swim than does the Englishman or German. Most Americans prefer a water temperature of 75 to 80 deg.

In this connection it should be borne in mind that there is a tendency for the temperature of water in many open-air pools to rise above 82 deg., at which point it becomes increasingly difficult to inhibit the growth of algae and certain bacteria. For this reason a good supply of cold water should be made available to temper or reduce high temperatures of the pool water during sustained periods of hot weather.

Other cardinal points in the conception and design of a swimming pool and bathing facilities include (1) a simple and easily followed bathhouse system with a minimum of rules and regulations; (2) wading facilities for very small children, set apart from the main pool; and (3) the main pool containing an area in which patrons can splash and where swimming can be taught, and an area for the expert swimmer who wants to exercise and practice, and also the diving section where the water is deep enough for safe diving.

It is a great mistake for any municipality to operate a pool free-of-charge to the patron. Since the general taxpayer usually bears the cost of construction, all maintenance and operating expenses should be borne by those using the facilities. Patrons seldom object to paying a small fee for using the privileges of bathhouse and pool. In fact, it has been noted in widely separated areas that patrons paying such a fee have more respect for the facilities than do those paying nothing. For some strange reason it seems that many people, when they are admitted "free", feel called on to do some act of vandalism or defacement of the property while using the facilities provided for them.

Bacteria in Mine Drainage Accelerates Rust Formation

Drainage from many abandoned coal mines has for years been a source of stream pollution, much of which is noticeable as the red dust precipitates in the streams receiving such drainage. Less noticeable to the eye is the acidity of the water draining from the mines. The formation of the acid and the red iron oxide has in the past been ascribed to simple atmospheric oxidation of pyrites and marcasites.

In a study of the causes of acid and rust formation sponsored by Bituminous Coal Research, Inc., evidence points to the conclusions that the reactions are not as simple as indicated above and that microorganisms may play an important part in the oxidation of the iron and also possibly in the formation of the acid. These studies were described before a recent meeting of the American Chemical Society by M. E. Hinkle and W. A. Koehler of the West Virginia University Engineering Experiment Station.

Collected acid mine waters, clear and colorless, after standing several days in a container form a reddish brown precipitate, they reported. If, however, the freshly collected water is sterilized by boiling or by the addition of bactericides, the oxidation does not take place after months of standing. A synthetic mine water made in the laboratory from chemicals will not oxidize to form the reddish brown precipitate. If, however, this synthetic mine water is inoculated with a few milliliters of a natural mine water, oxidation takes place in a few days.

The microorganism responsible for at least part of the oxidation of the iron from the ferrous to the ferric state has been tentatively identified as *Thiobacillus thiooxidans*, for a bacterium fitting the description of this organism has been repeatedly isolated from acid drainage from bituminous coal mines.

Preliminary investigations also point to the possibility of microorganisms playing a vital part in the oxidization of the pyritic material in mines to produce acids.

Plans are now under way to study this problem, together with a further investigation of the causes of oxidation of the ferrous sulfate to the ferric state.

Fig. 1. John Hancock Village near Boston has buildings on only a small percentage of the land of the rental development.

Housing Design For Construction Economy

Contents in Brief—Metal partitions and trusses, wire and paper forms for floor concrete and other devices to minimize on-site labor needs were designed into apartments built in the Boston area. Plaster board nailed to steel studs serve as the interior walls; soundproofing between apartments is provided by having each side of the common wall supported from a different set of studs. Gas-heating units serve two to four homes, using hot water pumped through coils in concrete floors for heat transfer.

PLANNED FOR ECONOMY by the contractors doing the building, Hancock Village, a 789 living unit two-story garden-type home community in the Brookline-West Roxbury area of Boston has features designed to keep on-site work to a minimum and thus reduce costs.

For example, metal studs and framing are used in partition walls to cut lumber use and provide maximum fire resistance. And bar joists carry waterproof paper, supported by mesh which acts as reinforcement for the concrete floor it supports as a form.

Hancock Village is a permanent rental investment of the John Hancock Mutual Life Insurance Co. and is being built and operated directly under its management. The 789 homes are in semi-connected groups of buildings with two or three homes in a unit. Three or four such units are built together but are at different elevations to fit the terrain and eliminate the appearance of row houses. Each home is on two floors, a typical layout providing a 20x16-ft. living and dining space plus the kitchen on the first floor and one or two bedrooms and bath on the second floor. Adequate closet space is provided by built-in wardrobes with sliding doors.

Foundations are simple spread footings 20 in. wide and 12 in. deep at 4 ft. below finished grade with an 8-in. concrete block wall to the ground line. Fiber-glass insulating material 1 in. thick is laid back of the foundation wall to prevent heat loss from the slab edge. Packed earth inside the foundation is topped with gravel varying from 5 in. to 8 in. deep to force drainage to one side. Sewer and water lines are laid in this gravel.

Waterproof paper is placed over the gravel and on this is laid pipe coils for radiant heating of the first floor. A 4-in. thick floor of 2,500 psi. mesh-reinforced concrete is poured in place and troweled smooth.

Exterior walls all are bearing walls and are of 4-in. brick backed with 4-in. cinder block. They are furred with 2x2 strips at 16 in. centers, between which insulation bats are installed and on which plasterboard is nailed to serve as a base for finish plaster.

Metal bearing walls

Load-bearing partitions are built on light-gage steel members into which nails may be driven through a crimped slot which holds them by friction. Non-bearing partitions are framed of wood studs at 16 in. centers. Plaster board $\frac{3}{8}$ in. thick is

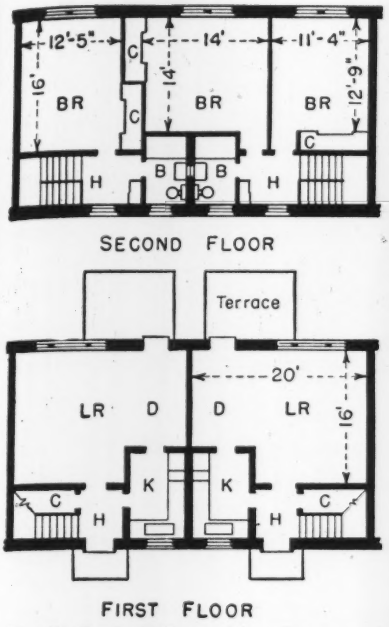


Fig. 2. Typical floor plan of one and two bedroom homes. A few units are larger with the living room and dining space area 22x17 ft.

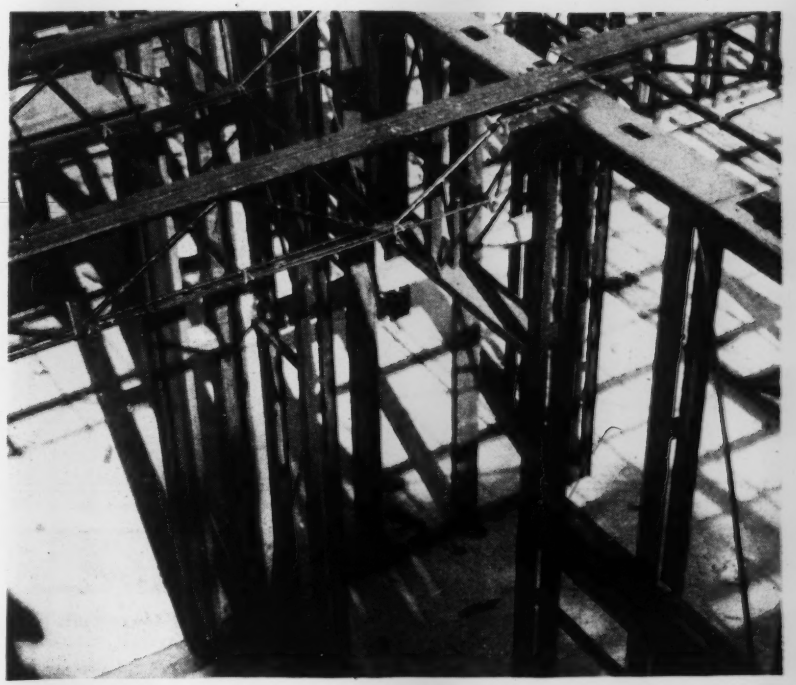


Fig. 3. Metal-framed bearing partitions and bar joists support the second floor.

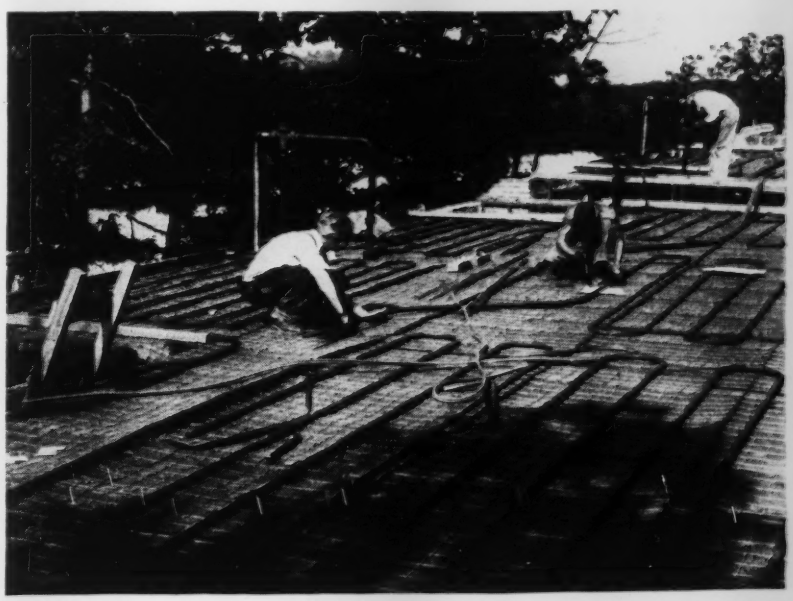


Fig. 4. Reinforced paper, supported by bar joists and the wire mesh integral with the paper serves both as the work deck and form for second-floor concrete.

nailed on each side of each type of wall and then given a finish coat of plaster.

Partitions between apartments have a hollow space 4 in. wide and are soundproofed by using 2x3 studs at 8 in. centers with alternate studs staggered to hold one wall only, thus reducing sound transmission. Firewalls between building units are 8-in. cinder block, furred with 2x2 in. strips and plastered both sides.

The second floor is carried on 10-in. deep joists made of rolled steel and welded bars. Joist ends are built into the brick walls or are tack-welded to the interior bearing partitions. Joists are at 2 ft. centers and span up to 17 ft.

Paper form for concrete floor

Over the bar joists an asphalt impregnated paper is stretched tightly, depending for support on integral wire mesh on top of the paper but tied to it at intervals. Bar joists at the ends—against which pulling is done to stretch the mesh and paper—are braced temporarily to prevent lateral bending. Mesh and paper serve both as a working floor for placing coils for radiant heating, and as a form for a 2½ in. poured concrete floor. The paper sags a little between joists and there is a little drip through it from concrete placing, but use of the paper is said to be economical.

Three-quarters of the buildings have pitched roofs built over prefabricated wood trusses while, for architectural reasons, the other buildings have flat roofs on steel joists. Wood trusses for the pitched roofs are made of 2x4's and 2x6's in a shop set up on the site. They span 25 ft. and are used at 2-ft. typical spacing. Trusses are raised to the roof by a crane and set by hand. Wood sheathing is used as a base for asbestos shingles.

For the flat roofs ½ in. gypsum board is used as a base for a 2 in.

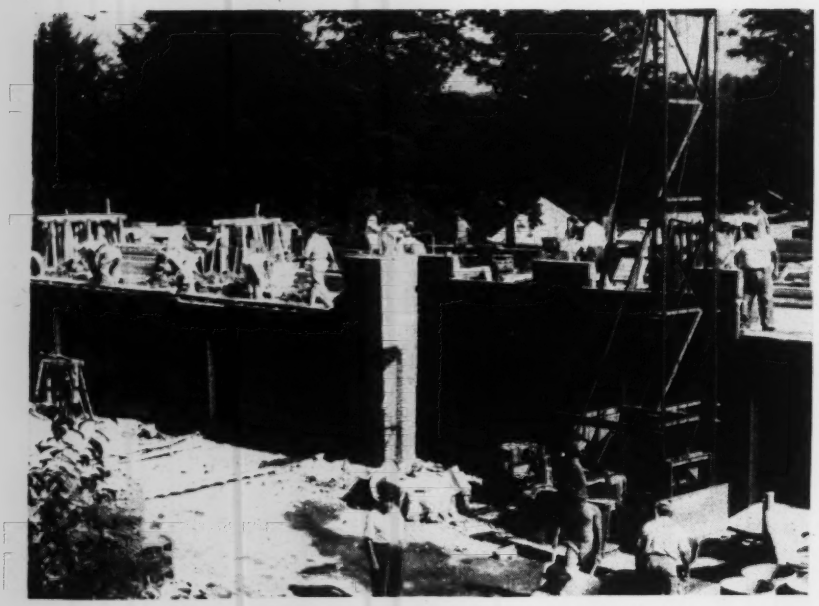


Fig. 5. Brick for use above the second floor is raised by portable tower unit.

Fig. 6. A typical street showing how the "row-house" appearance has been avoided by the introduction of curves and changes in grade.

poured gypsum roof covered with 4-ply built-up-roofing. Ceilings for the first floor and for the second floor of the flat-roof units are plaster on metal lath, hung from small steel channels spaced at 16 in. centers transversely under the bar joists. Plaster board nailed under the wood trusses of the pitched roofs serves to hold finish plaster for the ceilings. Above the second floor ceiling 4 in. of insulation is used. Plaster board for interior walls and second-floor ceilings is aluminum-foil backed.

Double-hung, aluminum sash are used for the windows, the living room of each unit having a large "picture" window. Interior doors are of wood in metal bucks.

Stairs are necessary for each home in the two story arrangement of this development. With 789 sets of stairs to build and install there was plenty of reason to plan the work for economy of field labor. The stairs are prefabricated at a millwork plant in three major assemblies—first floor to landing, landing, and landing to second floor. Material to enclose a closet under these stairs is precut and assembled after the stairway proper has been erected.

Stair treads and risers are oak housed into a soft-wood skirt board, and are wedged and glued to the skirting. This makes the assembly sufficiently rigid to eliminate the customary carriages of stair horses. A steel railing is entirely prefabricated and is attached to the assembly by wood screws. The complete stair is set by two men in four hours working time.

Circulating hot water

Radiant heat requires hot water for circulation through the floors so gas-fired heaters are used for each two to four living units. The heaters are located over the stairs a little above the second floor level and pumps, controlled by thermostats in the individual homes, are used to circulate hot water for the heat required. Hot water for domestic use is supplied by separate gas-heated units connecting to one to four homes in adjacent buildings. Refrigerators and stoves in each apartment operate on gas.

Piping for hot water and gas is carried over the second floor ceilings as are telephone and electric lines. Catwalks provide access for maintenance men but there is no attic access for tenants.

Interior finish of the homes in the development includes prefinished oak floors laid in mastic and asphalt tile for kitchen, bath and hallways. Walls are painted.

The scale of rentals at Hancock Village ranges from $73.50 to $106.00 per month for homes of 3½ to 6 rooms plus $14.00 to $24.00 per month fixed charge for heat, light, gas, water, electricity and maintenance services.

While some of the homes will be available this fall, shortage of bricklayers has made it impossible to complete the enclosure of all buildings this season. Unless the buildings could be inclosed, the first floor slab was not placed as frost heaving might damage the floor-heating coils.

Design of the entire project and its construction is being conducted by the Ring Engineering Co., Washington, D. C.

Continuous Beams Simplify Design Of Footings for Four-Story Building

REPLACING a building completely destroyed by fire, Renberg's new clothing store in Tulsa, Okla., is a four-story, reinforced concrete rigid-frame structure, 50x140 ft. in plan, hemmed in on two sides by existing buildings. Utilization of floorbeams continuous over two supports and having cantilever ends enabled the columns to be located about 10 ft. inside the property lines. This design has many advantages, not the least of which is the resulting simplification of footings.

Two rows of interior concrete columns are used, creating a 29-ft. wide central aisle along the length of the structure. The columns are spaced about 32 ft. apart longitudinally. Since these locations permitted footings to be placed where there would be no interference with existing walls, they greatly simplified foundations.

Footings rest on sandy clay and were designed for a unit soil pressure of 5,000 psf. Interior footings are stepped, with the upper portion 6 ft. square by 1 ft. 6 in. deep and the base 11 ft. 6 in. or 12 ft. square by 1 ft. 9 in. deep.

In the rear bay, a basement has been excavated. The floor in the basement and in the forward portion of the building at street level is a 4-in. thick concrete slab reinforced with wire mesh. All other floors consist of a 2½-in. top slab with 4½-in. wide by 8½-in. deep ribs spaced 24½ in. c. to c. The roof slab is similar, except that the top slab is only 2 in. thick.

The floors are supported on 16x20-in. reinforced concrete beams, with spacing varying from 9 ft. to 11 ft. 7 in. In turn, the floorbeams are carried on 24x32-in. continuous girders but cantilever beyond.

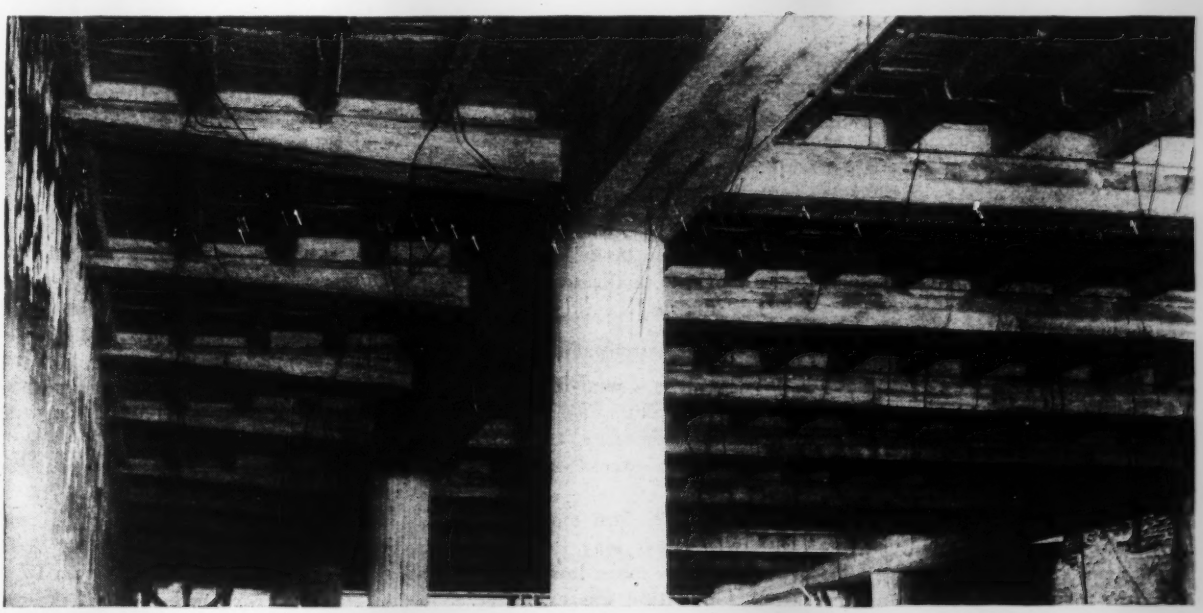
Besides simplifying the footing design, this arrangement has several advantages. It made possible salvaging existing firewalls on either side of the building by keeping the columns away from them. The beams do not load the damaged walls, but actually give them lateral support and eliminate the need for shoring. In addition, bending moments due to the cantilever loading help to reduce the moment at the center of the 29-ft. span and make the design economical.

At the front of the building, the floor girders are supported on concrete pilasters, which extend from the second floor to the roof. These members are monolithic with the structural front wall, which tilts toward the street on a ½ on 12 slope. From the second to the third floors, this slab is 1 ft. 6 in. thick, but above, it is only 1 ft. thick.

Faced with marble, the front wall combines with a 24x36-in. enlargement at its base to form a deep beam that spans between the two steel columns at the property line. This beam also carries the loads transmitted by the two pilasters, the floor load from the front bay at the second-floor level and a reinforced concrete canopy supported on the underside of 12-ft. long cantilevered extensions of the second-floor girders.

To simplify formwork, dimensions of columns above the first floor and of the portions of the ribs, beams and girders below the top slab, are duplicated throughout the building. First-floor concrete columns are 34 in. square, but all others are 24-in. dia. This duplication was accomplished by varying column concrete strength from 3,000 psi. at the top to 5,000 psi. at the bottom.

Architects are Joseph N. Boaz; Parr and Aderhold, associate architects of Oklahoma City, Okla.; structural engineers, Cochrane, Hendrix, Fell & Wheeler of Tulsa, Okla.; and contractors, Tulsa Rig, Reel & Manufacturing Co.



Utilization of continuous structural members for Renberg's new four-story, reinforced concrete clothing store in Tulsa, Okla., was economical in simplifying the footing design, providing 29x32-ft. bays and salvaging existing firewalls.

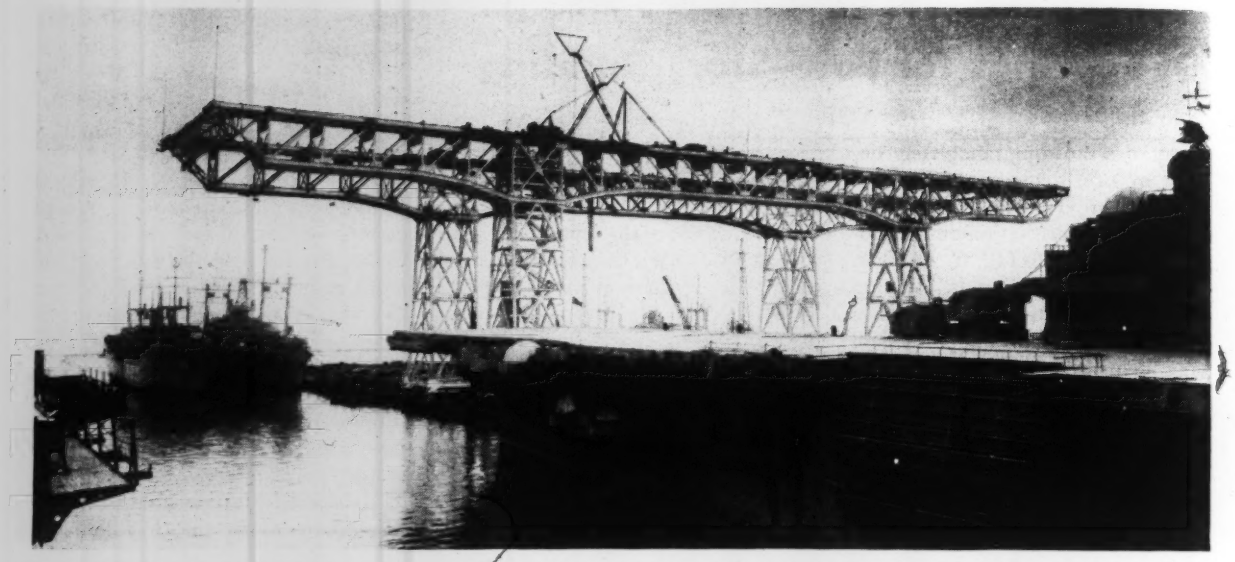


Fig. 1. The 730-ft. long twin runway structure supports two bridge cranes, each capable of a 245-gross ton hook lift.

Navy Builds World's Largest Crane

Contents in Brief—The world's largest crane equipment, capable of a 450-ton lift, is now undergoing final tests in the San Francisco Naval Shipyard. The rig is designed to expedite the repair of major fleet units of the Navy and consists of twin bridge cranes mounted on twin runways, 730 ft. long. Improved mechanical layout is featured. Foundation conditions were such that the crane and the pier on which it rests are designed to compensate for settlement.

SOON to be placed in operation in the San Francisco Naval Shipyard is a crane capable of lifting 450 long tons, said to be the largest crane in the world. Designed and built under supervision of the Navy's Bureau of Yards and Docks, the crane will make possible repair of major fleet units of the Navy more quickly and efficiently than has ever before been possible. It can lift an entire battleship turret at one time.

The crane runway is 730 ft. long and spans a pier 405 ft. wide, resulting in the runway's fixed cantilever arms extending 162½ ft. beyond the pierhead line at each side.

This pier has berth lengths along the sides of 1,700 ft. and 1,000 ft. As its name (regunning pier) indicates, the primary function of the pier is to replace the heavy naval rifles of major fleet units. Two bridge cranes will operate on the runway, each capable of a 245-ton lift. Thus, ships berthed on each side of the pier can be serviced simultaneously by the bridge cranes operating individually. When a turret or other heavy item is to be lifted, the cranes can operate in tandem and lift up to 450 tons. (Equalizer beam and hook weigh 40 tons).

Much earthmoving required

The pier is a sand fill, with the fill depth exceeding 100 ft. for major portions of the pier, which required earthwork in excess of five million cubic yards.

At the site, firm material consisting of a sandy clay lies some some 100 ft. below mean low water. Firm rock foundation was estimated to be about 100 ft. further down. In constructing the pier, a trench 80 ft. wide and U-shaped in plan was excavated around the perimeter of the pier to the firm sandy clay material. All bay mud and foreign matter was taken from this trench and it was refilled with sand to a level of about 45 ft. below mean low water.

A cofferdam of cellular sheet-pile units was then driven around the perimeter of the pier and the final fill was made inside of this structure. Thus the cofferdam acts to constrain the fill and yet allows sufficient depth at the pierhead line for the largest ships afloat.

To have provided a foundation for the crane towers extending to firm material would have required a system of unusually deep caissons or long cellular steel piles that would have been very expensive and required much time to install, so the crane and fill were designed with some settlement expected.

Each of the four towers of the crane contains four legs, and each leg is supported on a separate footing consisting of steel H-piles about 92 ft. long. As a result, there is from 15 to 25 ft. between the bottom of the piling and the firm sandy clay material. Special care was taken during con-

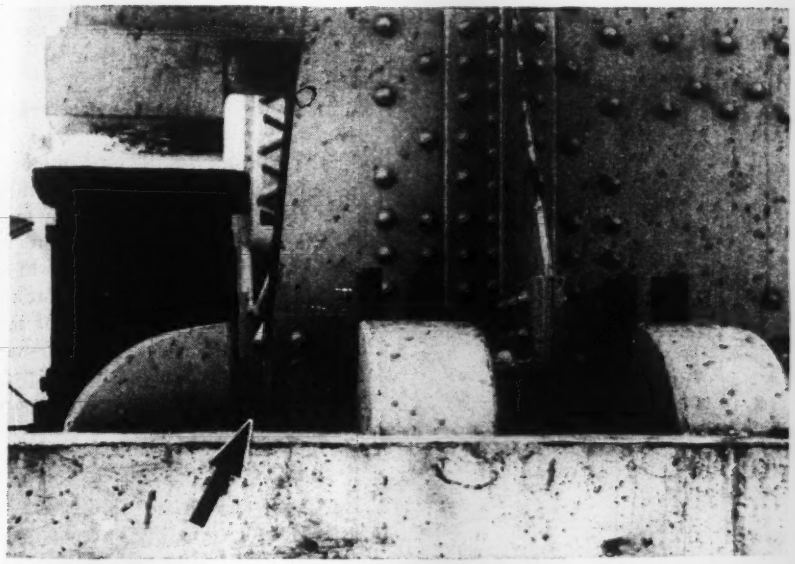


Fig. 2. Each leg of each tower has provisions for jacking. A 500-ton jack is shown in place but not in contact with the jacking surface. Arrow points to shims inserted when tower was jacked 3 in. horizontally for final closure.

struction to see that these piles were not driven to firm material because such piles would not settle uniformly with the fill.

In all, 540 H-piles of 14 in., 73 and 89 lb., section were driven. The piles are spaced three feet in one direction four feet in the other. They were designed to carry 75 tons each, but, because dynamic pile formulas did not indicate that such loads would be carried, some piles in each group were load tested to 150 tons.

Steam pile-driving heads of the heaviest type were used on the H-pile footings. However, the casualty among driving hammers was high because of the lack of resiliency of the steel piles. A 4-in. jet pipe tapering to a 1-in. nozzle at its tip was used in connection with the driving, with water under a pressure of some 250 lb. Specifications permitted jetting to about two-thirds of the pile depth.

The tower footings are interconnected by concrete beams 4½ ft. square. The weight of these beams in the long direction between towers is such that a wooden pile support is required.

Provision for jacking the towers

Such settlement as may occur is expected to be of a uniform nature. In case of differential settlement between the crane towers or between legs of the same tower, provision has been made for jacking up the tower legs to account for such settlement. Each leg has a jacking bracket and can be supported on a 500-ton jack while shims are being placed. In case the differential displacement of the towers due to settlement is horizontal as well as vertical, the towers in question can be jacked a limited distance in a horizontal direction. Jacks of 300-ton capacity are adequate for such work. This feature was of importance in making the final closure on the structural steel erection.

Steel erection routine

In erecting the cranes, the towers were assembled by two stiff-leg derricks mounted on high frames and traveling on steel rails placed transverse to the pier. The framework on which each derrick was mounted was triangular in horizontal section. The derricks were operated in tandem for heavy lifts.

Upon completion of the towers, the runway trusses were erected by cantilevering outward from the towers. The length of the cantilever arm on each side of each tower was kept approximately balanced to prevent undue stresses on the tower legs. A traveling rig for erection purposes was placed on each runway for final erection.

Actually the erection of the runway trusses was not true cantilever construction because the closing or central span was not connected to each side by one point in a vertical projection only, as is true in much bridge work.

To make the final closing where both top and bottom chords of the trusses had to be connected at each side, the towers were purposely erected a few inches further apart than necessary. Final closure was made for each runway truss by jacking the north tower some 3 in. southward.

Another problem of interest in the

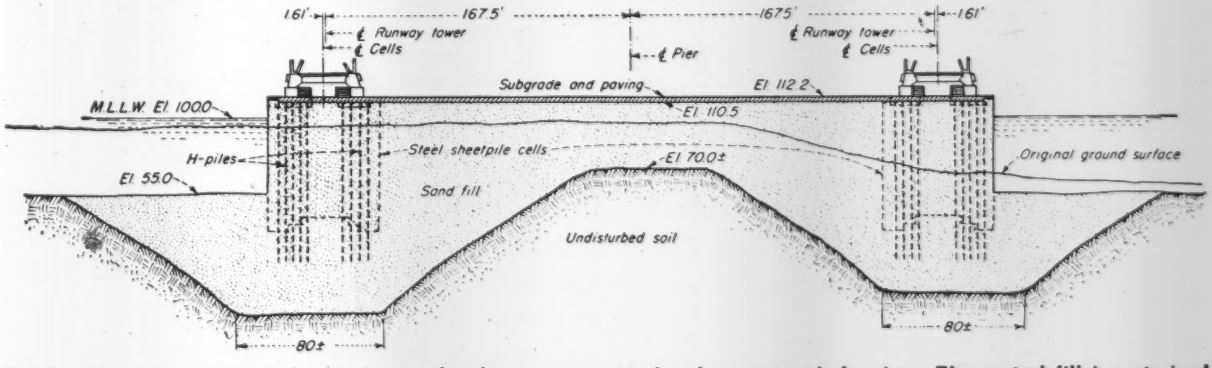


Fig. 3. This cross-sectional sketch shows subsurface construction for the crane and the pier. The central fill is restrained by a cofferdam of sheetpile cells that also forms the berthing walls.

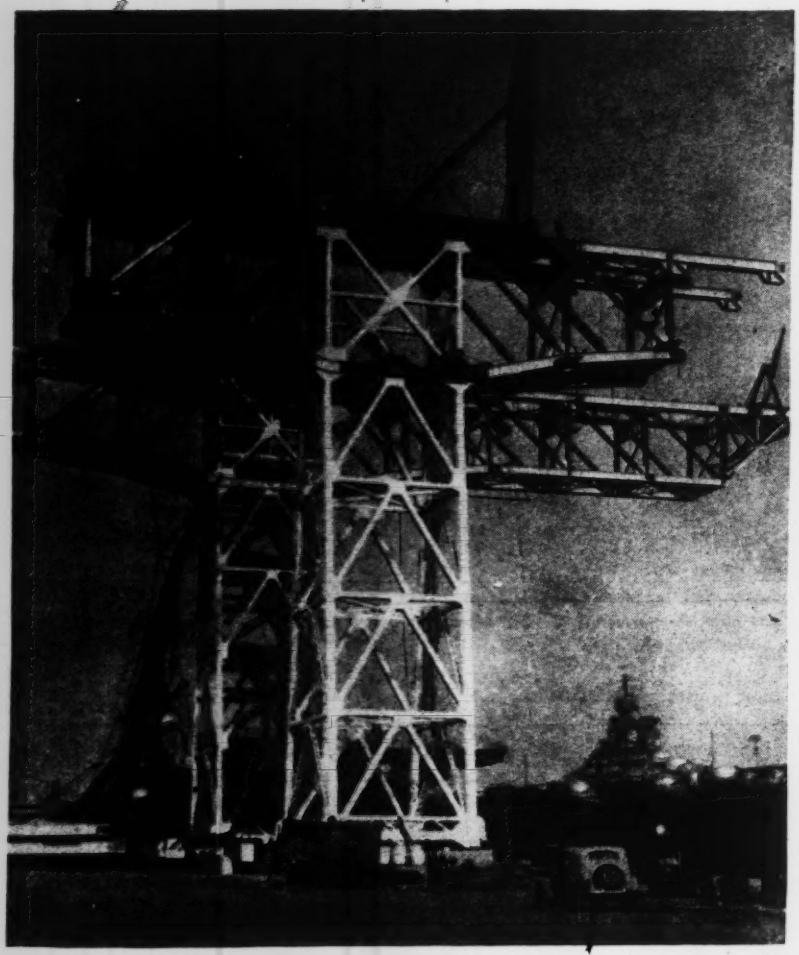


Fig. 4. The runway structure was constructed out from each tower in both directions at about equal rates to minimize unbalanced loading on the tower legs.

steel erection was the hoisting of the crane trusses to the runway. Four trusses, two main and two auxiliary, make up each crane. Each main truss weighed 110 tons. These trusses were hoisted 182 ft. and placed on the runways. Stiff-leg derricks on each runway were attached to each end of each main truss which was erected on the ground in a vertical position. Clever manipulation by a well-rehearsed crew of experienced workmen enabled the trusses to be snaked into position in about 30 minutes each.

Twin bridge cranes

The twin bridge cranes, each capable of lifting 245 long tons, operate on the 730-ft. runway 182 ft. above the pier deck. Auxiliary hooks will lift 50 tons each. To lift loads greater than 245 tons, the cranes are operated in tandem by first joining them together with couplings of the type used to connect railroad cars. This permits them to function as a single crane as far as propulsion across the bridge is concerned. An equalizer beam weighing some 40 tons with a large, double-barbed swivel hook in its center is suspended from the two main hooks giving a combined rated hoist capacity of 450 long tons at 10 fpm.

The equalizer beam is provided with lights which indicate the beam's inclination. These lights are powered by a storage battery mounted on the beam. When the inclination of the equalizer beam is less than 5 deg., green lights show at each end of the beam. Above 5 deg. the green lights are automatically turned off by mercury switches and a red light on the high end of the beam goes on. This permits the operators to lift the equalizing beam horizontally even though from their position they would otherwise be unable to accurately judge the inclination of the beam.

Power for travel of each crane along the runway is provided by four 50-hp. 600-rpm. small-rotor motors. One motor is located on each corner of the crane with the opposite motors on different tracks connected with a cross shaft. This arrangement, which is in contrast to the usual arrangement of motors at the center of the bridge, permits a considerable reduction in weight. Similar motors propel the trolley of each bridge crane back and forth on the bridge trusses.

Direct current converters

Most of the crane equipment is powered by alternating current, providing more economical and satisfactory performance than is true of the usual direct current installation. As the hoists require direct current, each of the two bridge cranes is equipped with a small convertor set to furnish such power, with the output for each set being 125 kw. When the hoists are not in use, the convertors remain idle. This is in contrast to the usual practice of constructing a motor-generator house on the ground and keeping the convertor in constant operation whenever any part of the equipment is used. Another advantage is that if a generator set breaks down, only one hoist is disabled.

Frequently a crane of this type must be rigged to a load that is still bolted to a ship, and the crane left hooked to the load until the work preparatory to lifting the load is completed. When such a condition prevails, a falling tide may increase the strain until some part of the gear fails. To prevent over stressing from a falling tide, the control on the power-set brakes includes a time relay that releases them approximately 20 to 30 sec. after the master switch is shifted to the "off" position. The spring set brakes are adjusted for a torque setting capable of holding the maximum load the relays will permit the hoist to lift, but the brake wheels will slip to pay out cable in case the hoist load reaches 170 percent of the rated load.

Operation of the cranes is controlled from cabs located at one end of each bridge crane structure in a

position to give maximum visibility of the crane hooks regardless of the trolley position. In tandem operation one operator controls the bridge travel mechanisms of both cranes, but each hoist and trolley movement is controlled from its own cab.

Operators to have radios

The operators' cabs are built similarly to airport towers, being glass-enclosed with sloping sides. Since the operators will be 167 ft. or almost 17 stories above the pier deck, they will not rely on visibility alone, but will be in contact with each other and the ground crew by police-type, short-wave radio.

A member of each ground crew will carry a walkie-talkie set for two-way communication. The radios will have two wave-lengths, a common one for tandem operation and separate ones for single operation so that communication of the two ground crews with the cabs will not interfere with each other. This is believed to be the first crane equipment of its general type equipped with radio.

Aluminum used in trolleys

By a liberal use of the aluminum, the total weight of each trolley was reduced by about 50 tons. Some of the principal members of the trolley are made entirely of aluminum, while seven members of each trolley are of composite design. A typical member of the latter type consists of a built-up box girder with the top cover plate made up of steel machinery castings and the remainder of the girder of aluminum, including the webs and the bottom flange angles and cover plate. The composite girders were assembled with cadmium-plated bolts. Machined lugs are provided between the steel and aluminum to transmit horizontal shear.

To prevent galvanic corrosion of the aluminum, a layer of insulating calking compound was applied between the steel and the aluminum. As a further safeguard against corrosion, the joints were sealed with the caulking compound to prevent the entrance of water.

The crane was designed and erected under the supervision of the Bureau of Yards and Docks. Rear Admiral John J. Manning, CEC USN, is chief of the bureau. Captain G. F. Nicholson, CEC USNR, was officer-in-charge of construction when work was started and he was replaced in 1946 by Captain W. T. Eckberg, CEC USN.

The pier and the crane footings were built by a joint venture consisting of Ben C. Gerwick, Inc.; Morrison-Knudsen Co., Inc.; and Ford J. Twaits Co. The crane runway was built by the American Bridge Co. and the crane by Alliance Machine Co., Alliance, Ohio.

Bromine for Pool Disinfection Finds Favor in Illinois

Bromine as a disinfectant for swimming-pool water is finding extensive use throughout Illinois. Of 44 pools that had adopted this form of treatment and were recently surveyed by the Illinois Department of Public Health, 39 reported that bromine was still being used. Results of this investigation received from 24 indoor and 20 outdoor pools are summarized in the October issue of *The New Swimmin' Hole*, monthly publication of the health department's division of sanitary engineering.

Reasons given for the changeover from chlorine to bromine reflect: (1) the difficulty of obtaining chlorine during the war; (2) greater safety and convenience; (3) the difficulty of maintaining a chlorine residual; (4) replacement of disapproved equipment; and (5) elimination of eye and skin irritations.

Questioned why bromine was preferred to disinfectants previously used four factors were cited. Listed in the order of their importance, these were: equipment was simpler and required less attention, fewer eye-irritation complaints, better bacteriological results, and the maintenance of more constant residuals. Other replies indicated that bromine was safer to handle and reduced algae more effectively than other disinfection.

The daily dosage of bromine varied from slightly under 1.00 to over 4.00 parts per million (based on pool volume and not on amount of water recirculated). A majority of pools reported that the dosage ranged from 2.00 to 2.99 ppm. However, six installations used a rate of 3.00-3.99 ppm. and five pools applied over 4.00 ppm. of bromine per day. Residuals of 0.2-0.5 ppm. were maintained in a majority of cases. Eight operators preferred a 0.5 to 1.0 ppm. range and one favored 1.0 to 2.0 ppm. bromine.

Thirty pools reported a pH varying between 7.0 and 8.0, but one showed a slightly acid condition (6.5 to 7.2 pH).

On the question of economy, results were divided almost evenly. That bromination costs more than other disinfection processes was supported by 12 replies, but 15 pool managers held the opposite viewpoint. No conclusive answer was recorded on 17 questionnaires.

Several operators qualified their opinions stating that cost depended on the amount of bromine used. Moreover, it was reported that, while bromine is from four to seven times as expensive as chlorine, equipment and maintenance expenditures were much less.

Two indoor pools have discontinued use of bromination. An athletic club pool prefers ultra-violet ray sterilization because the swimmer-load is light. A YMCA pool reports that bromine is too expensive, difficult to handle, dangerous to store and that the glass feeding equipment is too delicate. This installation now uses sodium hypochlorite together with a proprietary product believed to be a mixture of potassium bromide and hydrochloric acid. With these chemicals, an attempt is being made to maintain 50 percent bromine residual and 50 percent chlorine residual with pH about 7.5.

Caution in handling bromine—a dark, reddish-brown liquid with a specific gravity of 3.1—is advised because it vaporizes rapidly at room temperature, giving off highly irritating fumes. Upon contact with the skin, bromine causes burns and blisters.

The chief sanitary engineer of the Illinois Department of Public Health is C. W. Klassen. The swimming-pool program is under the supervision of Jack Sieg, senior sanitary engineer.

Mining a Deep Sewer in Unstable Soil

Contents in Brief—Unstable soil subject to excessive tremors from the impact of surface loads required mining in tunnel, using steel liner plates, for the construction of 11,700 ft. of precast vitrified-lined concrete pipe sewer in Cuyahoga Heights, Ohio. Air pressure of 18 psi. was required in sinking one 105-ft. work shaft and 13 psi. for some tunneling. Projecting the surface traverse survey for the center line of sewer through the tunnel required accurate surveying.

NO GLAMOUR but considerable painstaking planning and hard work characterized construction of a large sewer in the village of Cuyahoga Heights, Ohio. Located 40 to 100 ft. below the ground, much of the 11,700-ft. sewer penetrated a glacial drift in which pronounced tremors developed from the impact of forge hammers, freight trains, and other heavy surface loads.

As unpredictable pressures built-up in this silty clay—which varied from a consistency requiring power-spades for excavation when dry to the nature of quicksand when wet,—extreme caution was necessary both in designing the sewer and in working out safe construction methods.

The system is designed as a combined sanitary and storm sewer, with thirteen 16-ft. dia. work shafts, each containing a 5-ft. inside dia. manhole. Starting at shaft No. 13 near Harvard ave. and East 42d St., some 2,200 ft. of 45-in. line runs westerly, followed by 1,780 ft. of 48-in. sewer. At this point the line turns south and runs 1,200 ft. to the Cuyahoga River, all of which is 48-in. sewer. About midway in the north-south leg, a 42-in. pipe connects to the 48-in. line and runs 6,520 ft. southeasterly to a connection with the Cleveland Southerly Intercepter Sewer which leads to a sewage disposal plant.

The north and west lines of 45- and 48-in. pipe function as a combined storm and sanitary sewer. Under normal dry-weather flow they feed into the south line of 42-in. pipe which operates primarily as a sanitary intercepter sewer. During excessive storm water runoff they discharge directly into the river, while a sluice gate at the junction of the 42-in. and 48-in. lines permits a storm flow in the 42-in. intercepter equal to not more than normal dry-weather flow.

Fig. 1. Temporary brick bulkhead protects concrete-encased pipe for deep sewer construction in Cuyahoga Heights, Ohio.

To eliminate basement flooding

This $960,000 project, which was started Sept. 1, 1945 and completed last May, was built to eliminate widespread basement flooding. During the war, rapid growth of industrial buildings increased impervious areas such as, roofs and pavements, by 400 percent. As the original sewers had been designed only for residential and a small industrial-flow load, damaging overflows resulted from collection of unanticipated stormwater runoff.

Acid-resistant sewer pipe was specified to preclude disintegration from pickling liquor, sometimes discharged from manufacturing plants. Produced under ASTM specifications, Designation C-76-41, Table II, the precast, reinforced concrete pipe is lined with de-aired vitrified plates, monolithically cast with the pipe. Tongue-and-groove joints are coated with and all joints between liner plates are filled with acid-resistant compound.

In cross-section, the sewer consists of steel liner plates installed to an outside diameter of 6 ft. with "pumped-in" concrete filling the space between the plates and pipe. The composite sewer is designed to carry a load of 50 tons per lin. ft.

Preliminary studies disclosed that sectional steel plates used in mining and left in place would be safer and more economical than planking and timbers. As extra labor would be required to install timbering, and reliability and strength would be gained by use of liner plates, steel construction was selected. Added strength was essential due to unstable soil conditions which might result from excessive tremors imparted by heavy equipment operating on the surface.

Sectional ribbed liners, made up of $\frac{1}{8}$-in. skin plates on 5-in., 10-lb., I-beam ribs spaced 16-in. were used in sinking work shafts. Conventional ribbed lines, with a $\frac{3}{16}$-in. skin plate were installed in normal tunnel sections and $\frac{1}{4}$-in. plates in heavy sections. All liner plate was furnished by the village of Cuyahoga Heights, at a cost of $134,000. Some 1,150 tons were required on the entire job.

Location surveys were made by the contractor. First, the traverse was run on the surface and benchmarks established near work shafts. Dropping center lines into the tunnel and working therefrom with sufficient accuracy to insure closure of independently-driven tunnel sections called for a high degree of surveying skill. Vibrations made transfer of measurements difficult, but most of the heading closure were within 4 in. and could be adjusted readily in the last few feet of excavation.

In projecting the surface survey into tunnels, saw-cuts were made in the liner plates at the top of the shaft on the center line of sewer. Piano wire was tightly stretched between the cuts and two heavy plumb-bobs suspended from the wire were immersed in oil at the shaft bottom to minimize oscillation.

In twelve shafts, plumb-bobs were suspended 14 ft. apart and furnished the backsight for projecting tunnels. In shaft No. 2, however, plumb-bobs were dropped through the air-lock, permitting a backsight of only 4½ ft.

Upon completion of work shafts, installation of bottom liner plates, and the 2-ft. concrete shaft base, a

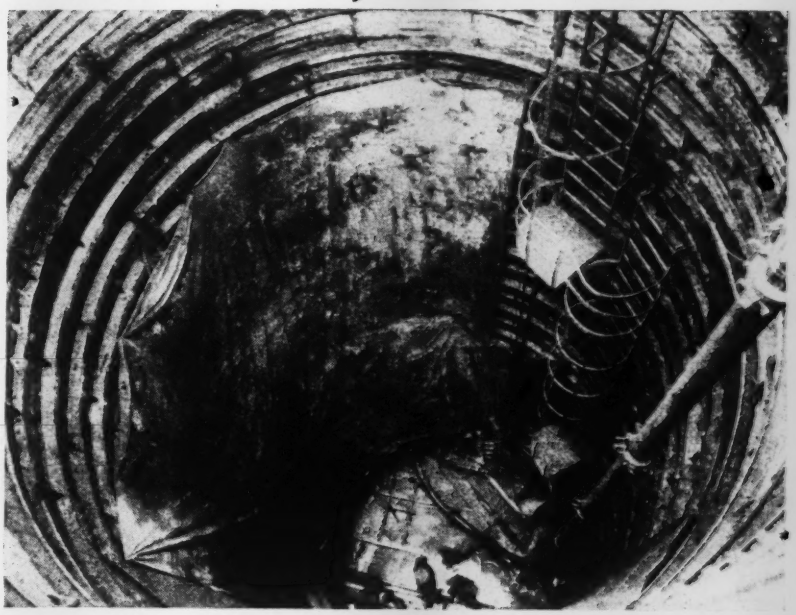


Fig. 3. Typical 16-ft. dia. work shaft—note safety ladder, canvas for protection from excessive seepage and pipe for pumping concrete into sewer line.

9½-ft. high by 7½-ft. wide portal frame of 10-in., 22-lb. ship channels was placed by crane, and welded to shaft liner plates at junctions of tunnel and shaft. Two 6-ft. dia. holes were burned through the plates in order to start tunnel drifting.

Except at end shafts, tunnels were driven in opposite directions either to a junction with a previously-mined section or about halfway to the next shaft. Maximum distance between shafts was 2,035 ft., and the longest drift was 1,025 ft.

Shafts were excavated by crane and either clamshell or buckets loaded by hand. Tunnels were mined by hand shovel and air-spade; excavated material was hauled to shafts by bucket cars operating on narrow gage rails, lifted to the surface by the crane, and trucked to disposal sites.

Initial drifting was started using only the two plumb-bobs for direction. After some 40 ft. of tunnel had been mined, a transit was set up about 20 ft. from the shaft and the line "bucked-in", by sighting on the plumb-bobs. The telescope was "flopped" and points on center line were set near the heading, in the tunnel roof.

Drifting was continued from points set at 100-ft. intervals until 200 ft.

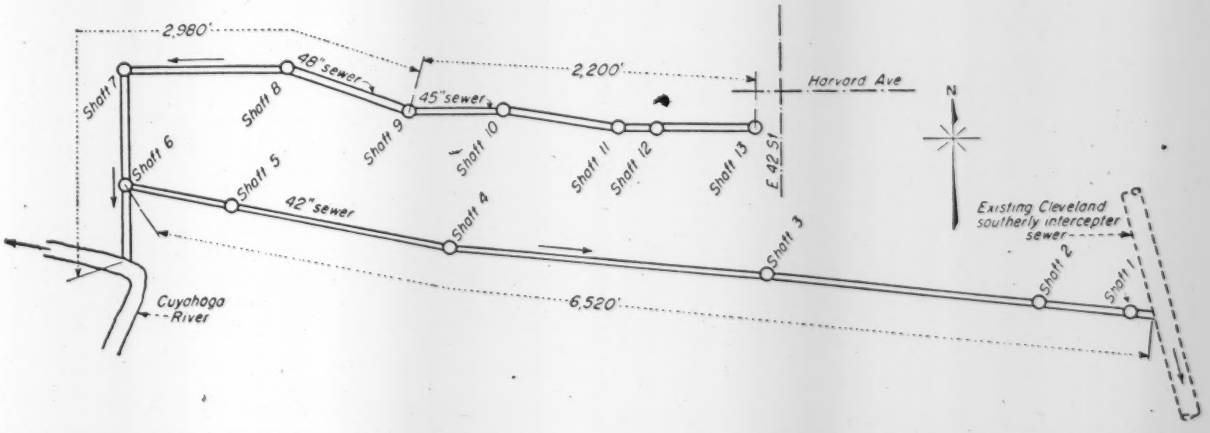


Fig. 2. Designed as a combination storm and sanitary sewer, the complete installation contains 13 manholes; 6,520 ft. of 42-in. pipe; 2,200 ft. of 45-in. and 2,980 ft. of 48-in. pipe—all precast vitrified-lined concrete pipe.

of tunnel had been mined. Then, the plumb-bobs were dropped again and the true center line was established. In elevation, the center line of tunnel was carried forward by hand level and chalk line, but an instrument check was made every 200 ft. The sewer has a gradient of 0.15 percent, but near the outfall it slopes 8.5 percent.

The last closure was very accurate and extremely welcome due to the partial failure of a bulkhead at the end of a previously mined section of tunnel. A faulty timber gave way and silty-clay material flowed into the tunnel. Moreover, a "riffling" action outside the bulkhead extended to the ground surface 90 ft. above.

Thus, tremendous pressure was created on the final tunnel section, making installation of the liner plates difficult. The contractor jacked steel polling plates forward to make a tunnel roof. This stopped the inflow and permitted junction of headings.

Drifting averaged 10 ft. of tunnel per 8-hr. shift, or 60 ft. per day using three shifts in two headings from one work shaft. The work crew for one shaft was composed of two miners, two muckers, four pushers, one "hooker" at the bottom of the shaft, one crane operator, one signal man, two truck drivers, and a foreman.

An air pressure of 13 psi. was required for mining some 600 ft. of tunnel between shafts 12 and 13, due to the close proximity of an overhead water-bearing stratum sand. No forced ventilation was needed for the remaining 11,000 ft. of tunnel as sufficient air was supplied by the exhaust from pneumatic air-spades operating under 90 psi. No serious accidents to workmen occurred during the entire construction of the sewer lines and manhole structures.

Air used in sinking shaft No. 2

One of the most difficult operations of the entire project was that of sinking the 16-ft. dia., 105-ft. shaft at manhole No. 2. Here compressed air was required, together with a variety of tactics, to sink the shaft. Some indication of the difficulties encountered can be seen from the fact that the shaft was started June 7, 1946 and completed, with concrete base poured, on Jan. 6, 1947.

The first 40 ft. of shaft, from ground El. 130 to El. 90, was sunk in a sandy-clay soil that became saturated as excavation progressed. At El. 90 infiltration of water was so great that air locks were installed.

The shaft was sealed with an 18-in. concrete slab at El. 100 and a 30-in. slab at El. 92, to form the first lock. Moreover, it was necessary to seal the lock with a 6-in. circular wall, between the slabs, poured directly against the liner plate. Otherwise, air escaped into the water-bearing sandy soil, set up a hydrostatic back-pressure, and forced water into the working chamber below the lock.

By means of lock No. 1, the shaft was sunk 11 ft. and a third slab was placed at El. 81 which, with a 12-in. circular sealing wall, formed the second lock. At this point the first slab was removed.

After 7 ft. more of excavation, a fourth slab was placed to form lock No. 3, following which, the shaft was sunk 10 ft. to El. 62. By this time (Nov. 18) the concrete locks and liner plate were so heavy that it was decided to reduce the shaft to a 13-ft. dia. to provide 18-in. bearing around its periphery for the load above.

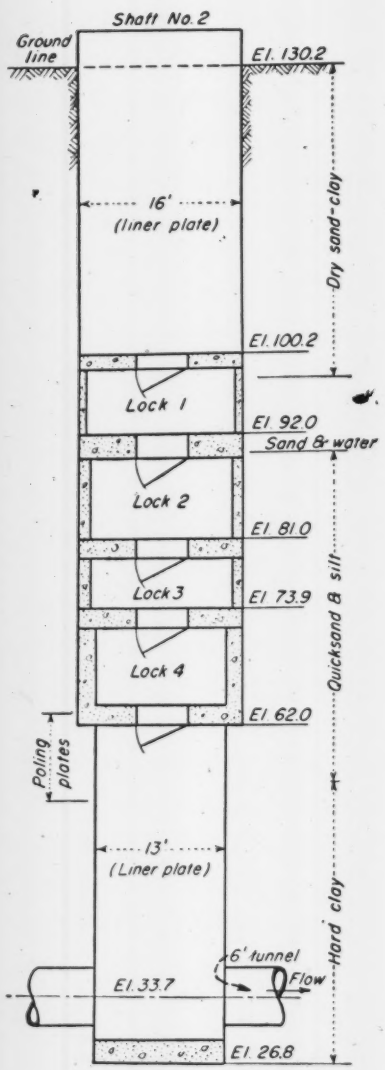


Fig. 4. Shaft No. 2—the most difficult to sink—required a combination of liner plates, vertical poling plates and concrete air locks.

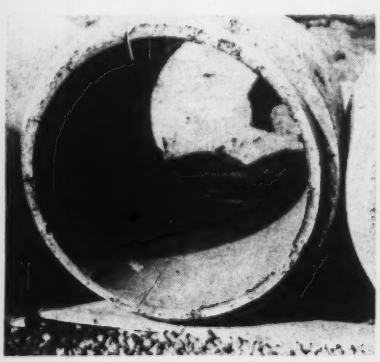


Fig. 7. Vitrified liner plates, cast monolithic with the concrete pipe, protect the sewer from strong acids that may be found in the industrial sewage.

Poling plates driven to refusal

It also was decided to try sinking the remaining 36 ft. of shaft with 10-in. self-locking poling plates instead of the steel liner plates which had become increasingly difficult to install.

But this method failed to provide the answer. After long poling plates had been jacked down 9 ft. around the periphery of the 13-ft. shaft, the "squeeze" pressure became so great that a 30-ton jack was broken while driving a plate into hard clay.

At this juncture the contractor suspended excavation and constructed a fourth air-lock by placing a 24-in. slab at El. 64, poured monolithic with an 18-in. circular wall and extending up to the slab 10 ft. above.

By using air-pressure of 18 psi. it was possible, with the aid of lock No. 4, to complete the remaining 27 ft. of shaft, using ⅜-in. liner plate reinforced with 5-in., 10-lb., I-beam ribs spaced 16 in. apart. Air pressure was maintained in the shaft during the placing of the 24-in. base slab and for about 20-ft. of tunnel each way from the shaft.

Construction of the 42-, 45-, and 48-in. precast concrete sewer pipe in the completed tunnel presented no unusual problems. Two precast concrete blocks were placed under each 5-ft. length of pipe for support on the liner. The intervening space between sewer and liner was filled with hand-placed brick set in mortar, concrete pumped into place, or, in areas subject to excessive tremors, a cushion of graded slag or gravel. In addition, all voids surrounding the steel liner plate were pumped full of grout consisting of one part cement to three parts sand. Grout was injected under a minimum pressure of 30 psi. through $1\frac{1}{2}$-in. holes in the liners.

The usual procedure in placing concrete around the sewer was to lay about 50 ft. of pipe, starting at the end of a section of tunnel midway between two shafts. A temporary bulkhead was placed around the near end of the sewer, through which some 40 ft. of 6-in. concrete line was left extending to within 10 ft. of the area to be concreted. The concrete pump at the top of the shaft was started, and after a few strokes, air was introduced into the line under a pressure of 80 psi., forcing the concrete to the end of the newly laid line of sewer. As work progressed the line was shortened by pulling it back through the bulkhead until the entire 50 ft. section was concreted.

All concrete used for the pipe and for filling, was ready-mixed and contained air-entraining cement.

The precast concrete pipe was manufactured by the Universal Sewer Pipe Corporation and the Concrete Pipe Company of Ohio, Inc., both of Cleveland, Ohio. The steel tunnel liner plate for the work shafts and tunnel was furnished by the Truscon Steel Co., Cleveland, Ohio and the Commercial Shearing and Stamping Co., Youngstown, Ohio.

John A. Petsche, village engineer, Cuyahoga Heights, Ohio, prepared the designs and supervised construction and inspection.

A contract for the entire project was executed by the Kalill Co., Cleveland, with Joseph Kalill in direct charge of the work. Henry B. Sherman was supervising civil engineer for the contractor; Arthur J. Hannibal was engineering assistant; and Patrick Heneghan, foreman.

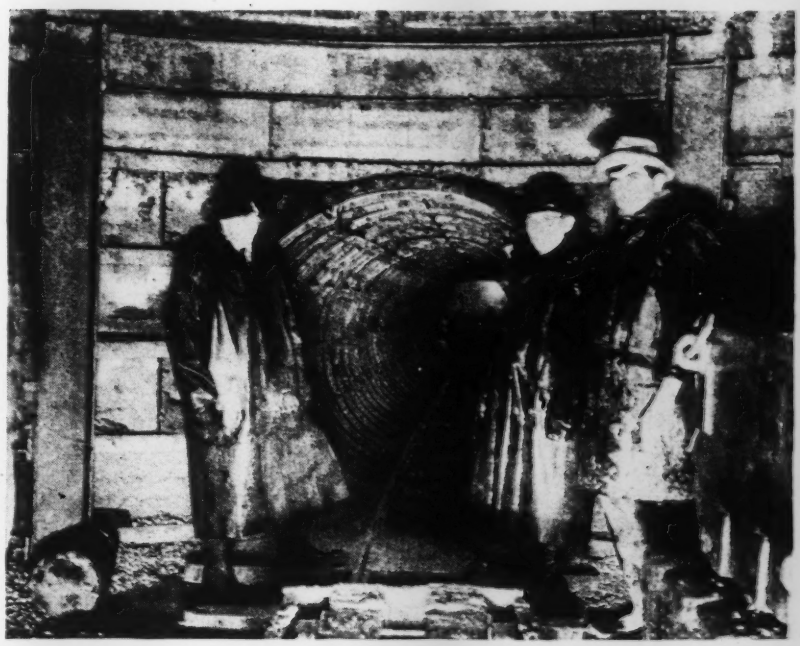


Fig. 5. Portal framing at bottom of work shaft expedited tunneling in two directions simultaneously. Excavated material was hauled to shaft on narrow-gage track.

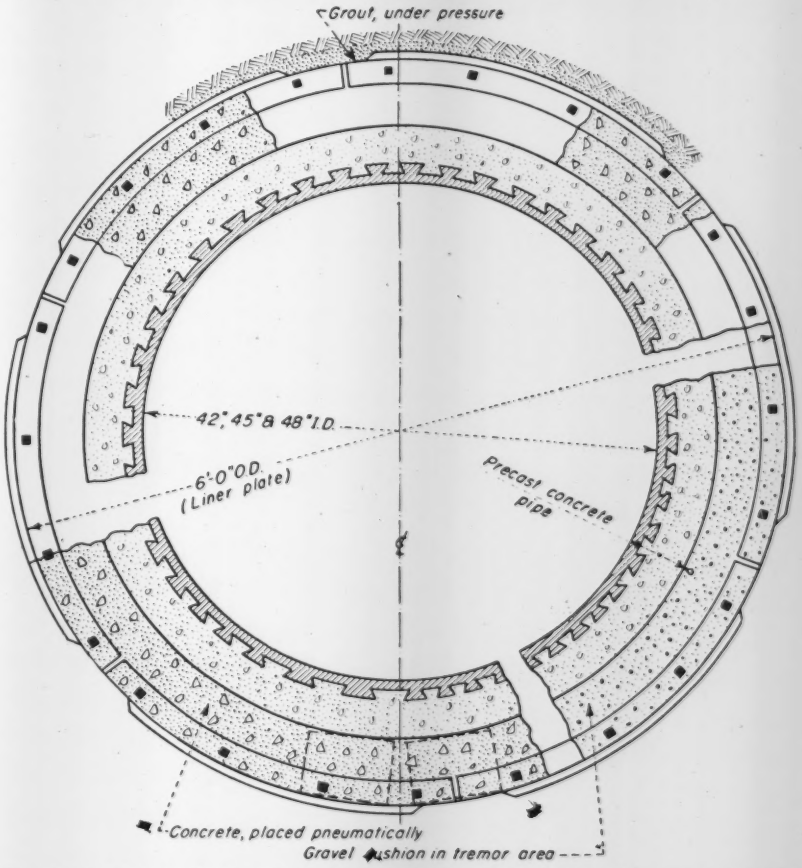


Fig. 6. Pneumatically-placed concrete between liner plate and precast concrete pipe produced a composite sewer section of tremendous strength. A gravel cushion was added in areas of excessive tremor.

Big Tunnel Aids French Expressway Plan

Contents in Brief—Traffic congestion in downtown Lyon, France, on a peninsula between the Saone and Rhone rivers, was so limiting the efficiency and growth of the city that an extensive system of expressways was the only solution. A belt line was completed before the war. Now a 50 ft. wide vehicular tunnel under a hill is nearing completion. Over a mile long, and with a unique ventilation system, it is a notable project. Also under way are marginal highways along the banks of the Rhone. Complicating factor is that 22 of Lyon's 24 river bridges were destroyed in the war and must also be rebuilt.

LYON, third largest city in France, with a metropolitan area embracing nearly a million people, is in the midst of a large scale highway improvement program designed chiefly to route through traffic away from the business section of the city, which is located between two rivers, much like New York or Pittsburgh.

The program consists essentially of four improvements: a semi-circular belt-line highway around the eastern half of the city, finished and in use; a large vehicular tunnel under the Croix-Rousse hill north of the city's central peninsula, now under construction; express-ways down both banks of the Rhone river, soon to be started; and several new bridges to link up these improvements, plans for which are being drawn. Current interest centers in the tunnel, which is a 50-ft. diameter, semicircular bore more than a mile long. A factor not contemplated in the original program is the necessity to rebuild 22 of the 24 existing river bridges which were destroyed in the war. (*ENR* Jan. 9, 1947, vol. p. 34)

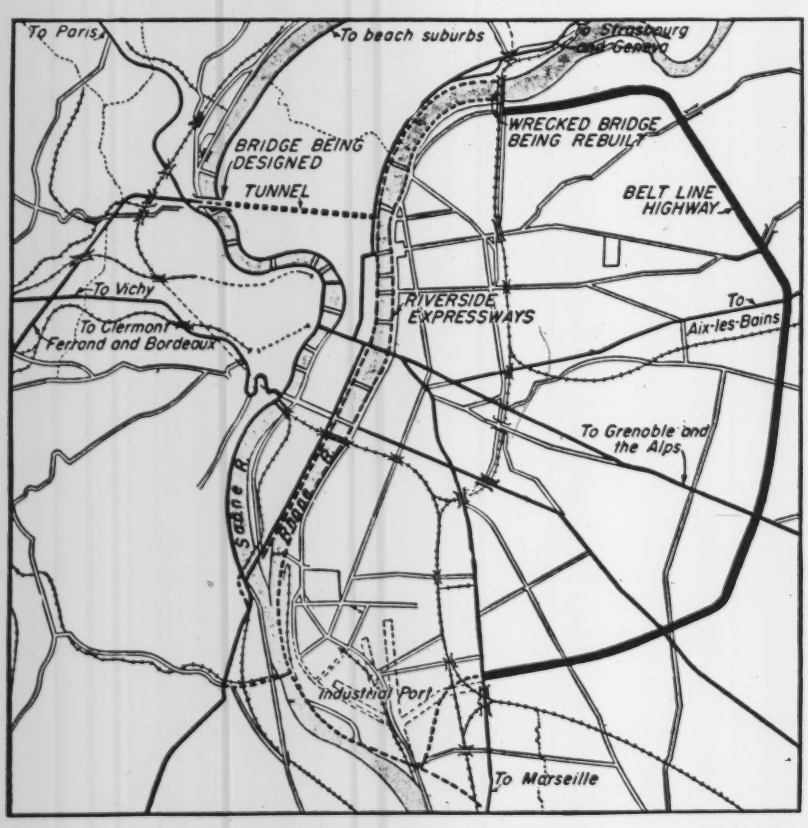


Fig. 1. Like New York and Pittsburgh; Lyon, France, has a congested business section between two rivers and needs express highways to improve traffic movement. The map shows a completed belt line, and a tunnel and marginal ways that are still under construction.

As early as 19 B.C. Augustus's son-in-law Agrippa, in building the Roman roads in Gaul, had made of Lyon a major traffic crossroads; and it remains so today. From the viewpoint of the through driver, however, Lyon's topography presents many inconveniences. The city lies at the confluence of the Rhone and the Saône rivers, with its central business section covering a long narrow peninsular between the two streams. To the west, rising sharply up from the bank of the Saône is a line of hills, and the north end of the peninsula also consists of a steep hill known as the Croix-Rousse. To the east, on the other hand, lies a flat plain over which the city has expanded in recent decades.

As a result, traffic from the west, north and northeast passes along the crowded quays of one of the rivers, and traverses the busy peninsula in order to reach the highways leading south-west, south or south-east. A study of the map (Fig. 1) will indicate how the new improvements are designed to reroute traffic away from the central congested area.

Modernization started in 1937

The general improvement plan was laid out as early as 1936, and work was started in March, 1937. The belt-line road, a separated four-lane blacktop highway circling the eastern part of the city, was completed before the war.

The tunnel under the Croix-Rousse hill, said to be the largest in Europe in cross-section, though not in length, was begun in 1939. Work continued slowly after 1940 and more rapidly after Liberation, so that today the

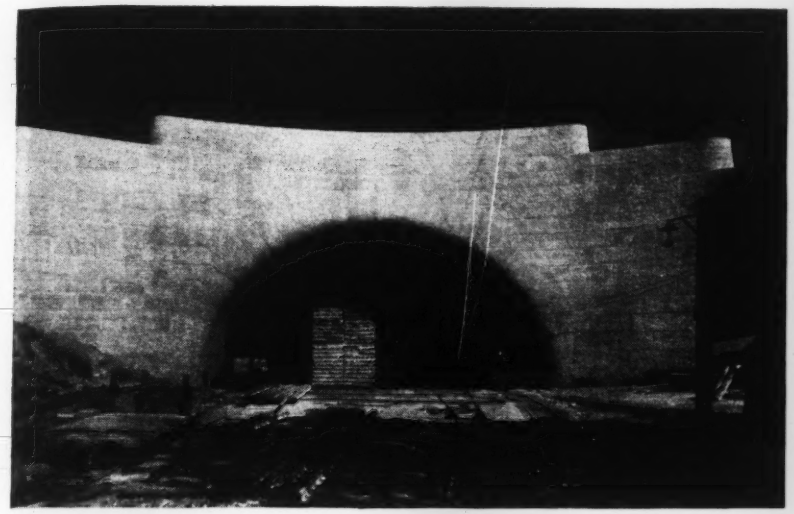


Fig. 2. West portal of Lyon's Croix-Rousse vehicular tunnel. Some 50 ft. wide and a mile long, the bore is one of the largest in the world.

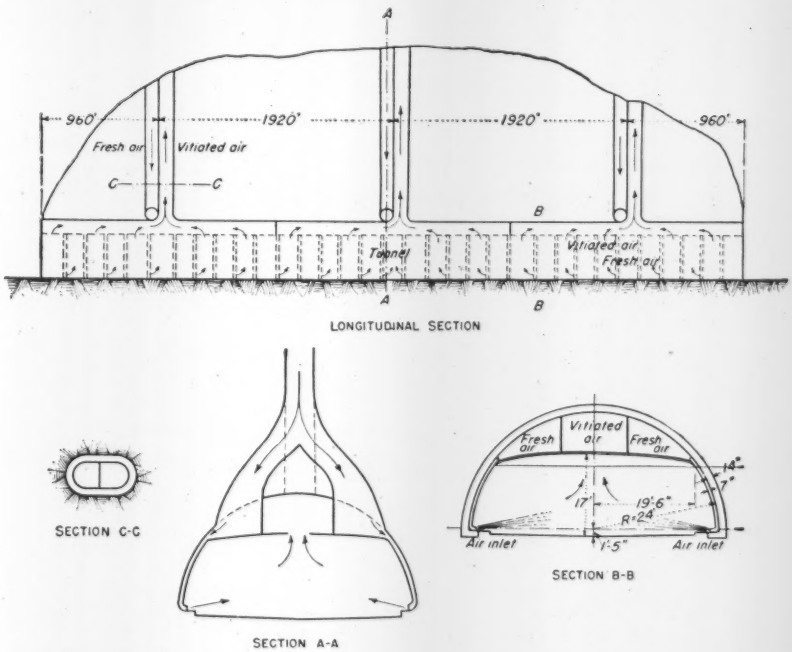


Fig. 3. Ventilation of Croix-Rousse tunnel involves three shafts to the surface that serve as both intakes and exhaust. Fresh air is fed to roadway from ceiling ducts, discharging through annular conduits in the tunnel walls.

tunnel awaits only installation of its ventilation and lighting systems, lining and roadway.

As shown in the drawing (Fig. 3), the tunnel is 5760 ft. long. It is 51.5 ft. wide to the outside of the lining and accommodates a four-lane two-way roadway of 39 ft. plus sidewalks. It is 24.6 ft. high and completely straight and flat. Since nearly all the tunnel was dug through granite, excavation outside the semicircular cross section was necessary only for about 300 ft. at the Rhone end where faulted sandstone was encountered. In this area a full circle section was bored.

The granite portion of the tunnel is lined with a 1:2:4 concrete, made with slag cement. The sandstone portion on the Rhone end, and a short sandy portion on the Saône side are lined with granite block backed with grout. A facing layer of white enamelled tile will finish off the tunnel's full length.

Digging of the tunnel was by galleries and stages rather than full-face except at the Rhone end. Full-face, highly-mechanized digging was considered somewhat hazardous by French engineers, apart from difficulties in obtaining equipment and the desire to conserve a large labor force from possible forced labor in Germany. It was also felt that the large use of explosives necessitated by the granite terrain ran the risk of damaging equipment and causing rock-falls. Danger of rock falls was also increased by the structure of the granite, which was found to be generally in cubes of about 5 to 6 ft. on each side. Water seeping between the cubes brought down clay, which tended to make the cubes slip.

Two bottom side galleries were started first, followed by a top center heading. The outline of the vault was then formed, working from the top gallery, with the spoil hauled out by cars run into the bottom galleries. Finally, after the vault had been established, the middle core was removed. The excavated granite was crushed outside the tunnel's entrance to provide aggregate for concrete.

Air-ducts over roadway

Traffic expected in the tunnel is about 15,000 vehicles daily, with 2,000 hourly at the peak, but artificial ventilation will be installed sufficient for 4,000 vehicles hourly. After considerable study of different types of European and American ventilation systems, it has been decided to employ a variant of the American type.

Since the Croix-Rousse tunnel is semi-circular, both intake and exhaust air-ducts will be placed over the roadway. A central exhaust duct running the length of the tunnel will feed into three shafts sunk from the top of the hill—one at a point half way from each end of the tunnel and the two others at the one-eighth points from either end.

To left and right of the exhaust duct will run intake ducts, feeding down along each side of the tunnel to roadway level. The fresh air will be supplied by ducts in the shafts containing the exhaust ducts. These shafts will be equipped at their top by fans powered by 80 kw. motors on the intake and 60 kw. motors on the

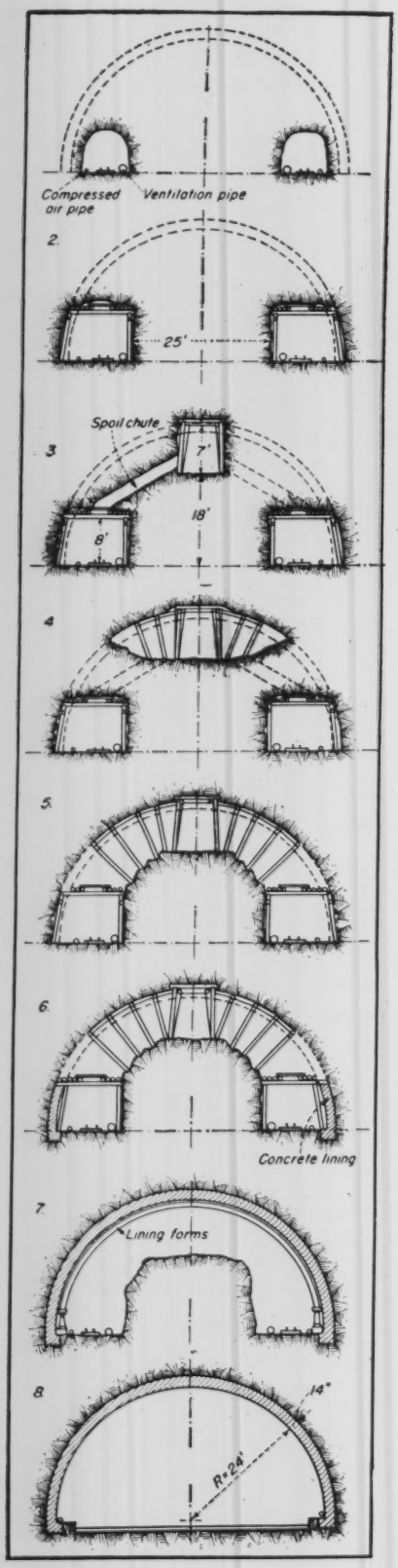


Fig. 4. Step-by-step excavation progress in making the 50-ft. semicircular bore.

Fig. 5. Ready-made marginal highway is provided by old landing wharves along bank of Rhone River. After renovation with new surface, protective railing and street connections, this road will be used by northbound traffic and a similar one on the opposite bank for southbound.

exhaust. About 1,500,000 cu.ft. of air per min. will be supplied.

Lighting will be by a single continuous line of fluorescent tubes along the ceiling, each tube being slightly over a yard long. To diminish glare and eye distraction, a polished circular aluminum disc about 12 in. in dia. will be fixed over the middle of each flourescent tube. Thus, motorists will not see the actual tubes.

Bridge reconstruction

The first of the new bridges, across the Rhone at the north end of the belt-line highway, was also begun in 1937, and by 1942 had been nearly completed. This actually consists of two structures, since in addition to crossing the Rhone at this point it was also necessary to span a railway line on the west bank. The new bridge over the Rhone was smashed, as were most of the other Lyon bridges, in the final period of the war. It is hoped to begin reconstruction next year and to build a single unified structure over both river and railway. This will involve lifting one end of the deck of the railway-spanning bridge, a hollow-reinforced concrete girder structure.

Next bridge in line for construction will be across the Saône, opposite the west entrance to the new tunnel, and it is hoped eventually to build also another new Rhone bridge opposite the tunnel's east entrance.

A final major project in Lyon's new through-highway system is to convert the low-lying abandoned stone-paved landing wharves along both sides of the Rhone into express highways. These wharves extend, at a considerable distance below the traffic-filled quays, most of the way between the new war-wrecked upstream bridge and the lowest bridge, 4.8 miles downstream, near the end of the peninsula.

The right-bank wharf would be sufficiently wide over most of its length to carry a four-lane highway, but passage under the numerous Rhone bridges would be impossible in several cases for four lanes. For this reason it is planned to build a 23-ft. two-lane southbound highway on the right bank, and a similar northbound highway on the left bank. Even so, special measures will be necessary in order to pass under three of the bridges.

The expressways will be sufficiently high to avoid flooding except during a few days each year. It is felt this occasional flooding will not damage the roads, which will simply be closed to traffic during such periods.

A section several hundred yards long of the left-bank expressway has already been built, (Fig. 5).

In charge of Lyon's highway improvement program is Jean Olivier, Ingenieur des Ponts et Chaussees, 5 quai des Celestins, Lyon.

Refuse Disposal Practices Analyzed At Michigan Public Health School

TRENDS IN METHODS and equipment employed for the collection and disposal of municipal refuse were discussed by some 70 public works and public health officials from eight states meeting in Ann Arbor, Mich. on Oct. 27-28. The occasion was an in-service training course sponsored by the School of Public Health of the University of Michigan. Although this was the 25th short course given by the School of Public Health involving problems of public and environmental health, it was the first one designed specifically to aid municipal administrators in raising health standards through improved methods of refuse disposal.

Topics chosen for discussion first were presented in detail by authorities in the field and then explored in panel discussions to virtual agreement on the best methods for handling garbage and rubbish.

Containers—Describing new equipment and labor-saving methods of refuse collection, Robert E. Neis, consulting engineer, of Griffenhagen & Associates, Chicago, stressed the fact that correct methods of storing refuse for collection are so important in keeping a city sanitary that no compromise should be permitted in the use of proper containers.

Consensus of the group showed a decided trend toward adoption of galvanized, corrugated sheet-metal containers of 20- to 30-gal. capacity, with reinforcing band on top and bottom and loose-fitting covers. Concrete vaults were said to be one of the poorest of storage receptacles.

Vehicles—Type of vehicle for transporting garbage and refuse necessarily should fit local conditions, with the selection of size based on minimizing lost time between pick-up and disposal points, declared Mr. Neis. Present trend in many cities is toward the purchase of bodies larger than those in general use. Cities in the far west seem to prefer closed bodies, while in the east and midwest, packer-type bodies are in greater demand.

In describing the several types of special refuse collection bodies developed recently, Mr. Neis pointed out the trend toward larger capacities and greater degree of compaction. Without mentioning trade names, he reported that three manufacturers offer a rear-loading, bucket-type body. One of these gives hydraulic compaction, one automatically compacts the material as the bucket is lowered, while the third raises the truck body after each time the bucket is raised thus compacting the material by gravity against the rear of the truck.

Two manufacturers use a smaller hopper built into the tailgate of the truck from which the material is pushed into the body by a small revolving plate operating in the hopper.

Two other manufacturers offer conveyor-type loading equipment for large body trucks used principally in the larger cities. One of these trucks has a single hopper at the rear, while the other mounts a hopper on each side, at the rear.

In both cases the conveyors carry the refuse up an incline from which it drops into the rear of the truck. Compaction is secured by successive conveyor flights moving the refuse forward over previously deposited material until the body is filled.

One manufacturer offers a movable body for handling refuse where a large quantity of material originates in one location. A tractor picks up the loaded body and hauls it to the point of disposal, leaving an empty body to be filled.

Some large manufacturers offer a low-pressure tire with an unusually heavy tread. These have proved satisfactory in resisting glass cuts and bruises, but are not reported to be so successful where high speeds are maintained for appreciable lengths of time. Important factors in selecting type of vehicle were listed as: Ease of loading, safety of loaders, capacity, maneuverability, dependability, cost of operation and cleanliness.

Labor—Collection and disposal of refuse by the so-called "task" system was viewed by several as offering an incentive to the employee. But the consensus was that careful administrative supervision is needed to prevent abuse of this system.

Public Education—The group was in agreement on the advisability of keeping the public informed of what steps were being taken to make any refuse-collection system operate to the best advantage.

Collections—Carl Schneider, consulting engineer, New Orleans, La., reported a trend in the frequency of residential collections in many cities to twice a week the year around, instead of three times a week in summer and twice a week in winter, before the war. In many localities, however, collections of garbage continue to be made on a weekly basis, he said.

The production of garbage and ashes is decreasing while the production of rubbish and commercial refuse is increasing. Mr. Schneider attributes this to the extended use of home-refrigeration and the increased prices of foodstuffs and fuels.

Sanitary Fill—Lewis Dodson, recently appointed director of environmental sanitation, City and County Health Dept., Denver, Colo., reported on that city's campaign to clean-up its refuse dumps. The city's seven old open-dumps have been eliminated by compacting and covering them with earth, thus eliminating the rat nuisance.

At present, Denver operates five so-called "area-type" sanitary fills. By strategically locating the fills to reduce the length of haulage, the frequency of collection has been doubled, without increasing the number of personnel or amount of equipment. Average costs of collection and disposal of garbage and refuse is running slightly under 40 cents per ton, said Mr. Dodson, based on an average of 7 cu. yd. of material per ton of weight.

Denver prefers this area-method of disposal to the "trench" method as it requires less land and is easier to operate since many of the refuse-haulers are private contractors. Mr. Dodson stressed the fact that Denver's area-method of disposal, involving compaction up to 70 percent, is prov-

ing far superior to the old dump-and-cover, landfill method, without compaction, particularly in the elimination of rodents and in the greater residential use of the reclaimed areas. The city has acquired sufficient land to operate by its present method for at least the next five years, he said.

At the end of the two-day session, Ernest Boyce, chairman of the department of civil engineering, at the University of Michigan, gave an analysis of factors influencing the choice of refuse disposal methods.

Such disposal methods not only should be selected on an economic basis, said he, but they also should be chosen on the basis of the overall problem of municipal housekeeping. He pointed out the inadvisability of any city merely adopting practices in use by a neighboring city.

Failure of any community to envision the entire refuse disposal problem is apt to result in unbalanced service, expensive to operate and difficult to maintain, warned Professor Boyce.

Other highlights of the in-service training course included a report on the Michigan Municipal League's recent survey on garbage disposal practices in Michigan, by John Huss, director of the league. Disposal of garbage by hog-feeding, as practiced in Flint, Mich., was described by Theodore D. Moss, director, department of public works.

The advantages and problems of incineration were outlined by Robert Stellwagon, consulting engineer, Detroit, while the disposal of garbage by grinding and treatment along with sewage was discussed in detail by Walter Drury, consulting engineer, Ann Arbor, and by George Wyllie, superintendent, sewage treatment plant, Lansing, Michigan.

Chairman of the two-day meeting was H. E. Miller, resident lecturer, School of Public Health, University of Michigan.

Four Cantilever Arms Fit Bridge To Curve of 110 Degrees

TO FACILITATE access to a commercial timber stand in the Tahoe National Forest a steel highway bridge 493 ft. long has just been built in which the roadway turns through more than a right angle (about 110 deg.) and yet requires in the form of supports in the steep canyon only two steel towers and one small bent. The bridge, which is a two-lane deck truss, is located on the north fork of the middle fork of the American River some 30 miles east of Auburn, Calif., and is designed for H20S16 loading. The roadway is a reinforced concrete slab 6½ in. thick and 25 ft. wide between curbs. The curvature for the full length of the bridge is uniform with a 250-ft. radius, and the roadway has a super elevation of ¾ in. per foot of width.

The roadway on this bridge turns through a 110 deg. central angle with a minimum of supports in the canyon. Between abutments the only supports are two steel towers and a small concrete bent.

Design of the structure was influenced by two controlling points on the adjoining highway, namely, a saddle on the ridge above the bridge and the curving, narrow canyon of the streambed above the bridge site. By making the bridge deck as high as was economically feasible, the road climbing out of the canyon was kept to the 7 percent maximum grade.

Despite the short radius curvature selected for the bridge, it was found possible to minimize supports in the steep canyon by designing the bridge as a six-span structure, of which four spans are six panels long and two have a length of five panels each. (The panels are all 15 ft. long in the truss on the outside of the curve and 14 ft. on the inner truss.) This division of spans made it possible to have each of the two towers support a portion of the truss cantilevered in both directions with both overhangs carrying a suspended load.

In other words, in addition to the central suspended span thus provided for, there are two other spans, one on each side of the center, that have the outer end slung from a cantilever arm and the inner end resting on concrete bent or abutment. The only intermediate bent is the one that appears in the picture, on the far side of the canyon. The near steel tower, is to support the suspended end of a span reaching to the near abutment.

Trusses for the central suspended span were assembled in the creek bed and lifted, one at a time, by two crane booms, one on the truck crane at deck level and the other mounted on a winch in the creek bottom. Although the bridge deck is about 100 ft. above the lowest point in the streambed, a 90-ft. boom on the lower crane was made adequate for this lift by picking up the load at bottom chord level.

The structure was designed by the bridge department of the Public Roads Administration. The Fred D. Kyle Co., Pasadena, was the general contractor; the Judson Pacific-Murphy Corp. held the contract for steel fabrication and erection.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Footing Enigmas Explained

Sir: The article, "Wall Footing Action Poses Enigmas," by Harold S. Woodward (*ENR* June 12, 1947, vol. p. 955), presents an interesting account of footing design and behavior. In two specific examples the author has pointed out the apparent enigmas displayed in the puzzling combination of faulty design and satisfactory performance. The writer will attempt to amplify Mr. Woodward's explanations of the phenomena involved.

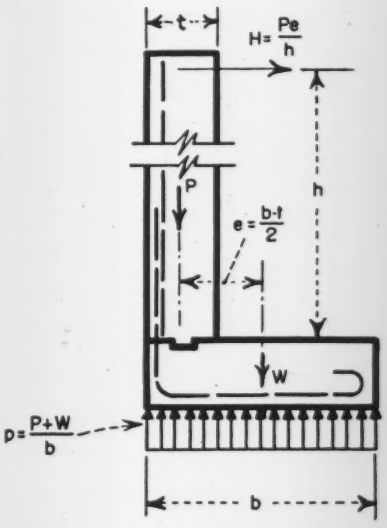
If the maximum soil pressure is excessive when computed by the straight-line theory taking into account the fact that net tension, or uplift, under the footing is an impossible condition, some plastic adjustment of the soil may take place, possibly causing a slight tilting of the footing without any very appreciable general settlement. The wall load then will be delivered very close to the wall's inside face, with perhaps some local crushing of the concrete at this location. (The condition assumed is not to be confused with that illustrated in the author's Fig. 3, which apparently represents a very definite failure by a shear slide.) Even though we still follow the severe (and incorrect) assumption of a straight-line pressure variation, it is obvious that the maximum pressure must now be considerably reduced. Thus, the offset footing can be advantageous, although its mode of action is not consonant with sound structural principles.

Unfortunately, the improvement in the soil pressure condition is accomplished with risk of damage to the supported wall. The wall load has been made more nearly centric on the footing only by rendering eccentric the reaction supplied to the bottom of the wall. It is evident that, with the load at the top of the cellar wall presumably vertical and centric, a force couple acts on the wall due to the now non-collinear vertical forces.

This couple is balanced by an equal but opposite couple composed of two horizontal forces. One of the latter acts at or near the bottom of the wall. It may be supplied by either the footing or the cellar floor slab. The other horizontal force, equal in magnitude but opposite in direction, acts somewhere along the height of the cellar wall. It may be supplied by the resistance of a retained earth bank or an abutting wall, or by the first floor structural system acting as a tie. In the latter case especially, the wall is subjected to considerable flexure and may fail by the opening of tension cracks in the lot line face.

A simple solution may be found in the use of reinforced concrete for offset footings, as is shown in the accompanying sketch. Reinforcement may be designed by analyzing the footing as a cantilever beam and the wall as a rectangular section subjected to combined bending and axial load. To provide economical, effective insurance against the effects of variations in soil conditions along the length of the wall, it is advisable also to call for longitudinal reinforcement in the wall. A reasonable provision might be two $\frac{3}{4}$-in. rods, continuous, top and bottom.

In general, however, design of footings, or "connections," is only a partial answer to the problem of providing an adequate foundation for a building. Also of vital importance is the question of the adequacy of the soil column in depth. Is the subjacent soil capable of bearing the additional loads to be imposed by the building without undergoing excessive compression productive of inadmissible settlements?



Reinforced concrete wall footing designed to carry eccentric load.

Fortunately, the latter consideration is not ordinarily the governing factor in the design of foundations for such light structures as those described by Mr. Woodward. The load imposed on the soil by a narrow footing rapidly dissipates. Furthermore, within the comparatively shallow depths materially involved, the chances are that the soil will not radically worsen in bearing capacity. These happy circumstances surely account in large part for whatever may appear enigmatic in the fact that light buildings seldom display distress caused by settlement, notwithstanding their usual lack of engineering design.

VICTOR R. BERGMAN
Godwin Construction Co.
New York, N. Y.

Central Valley Water

Sir: With reference to the news item "Sign First New-Type Pact for Central Valley Water" appearing on page 11 of the Nov. 6 issue, please bear with me a moment while I take exception to the statements presented therein as well as to the misleading conclusions that will undoubtedly be drawn therefrom.

The directors of the Orange Cove Irrigation District have not signed a "New-Type Pact". They have approved, as to form and contents, a negotiated contract only and have taken exception to the principles contained therein applying to the so-called 160-acre excess land provisions. California law requires contracts of this nature to be approved by the State District Securities Commission and a two-thirds affirmative vote of the people of the district before the contract can be signed.

It is with no small concern that I am busy hunting for 3,030 acres of irrigable land. As I read our contract I note that it stipulates delivery of project water to 24,030 acres instead

of 21,000, which brings us to the point of performing a few simple calculations and arriving at those misleading conclusions. Obviously, 31,800 acre-ft. of project water divided by the irrigable acreage of 24,030 gives approximately 1.32 acre-ft. of water. Dividing $5,431,000 by 24,030 acres gives a cost per acre of about $222, which divided by 40 years gives an annual cost of $5.55 per acre for laterals only.

Now we note that there is apparently but 1.32 acre-ft. of available water per irrigable acre, which is about half the annual requirement, and in addition to the cost of the laterals we must add the cost of the water and district operation and maintenance. In view of this there is certainly justification for questioning the feasibility of such a venture.

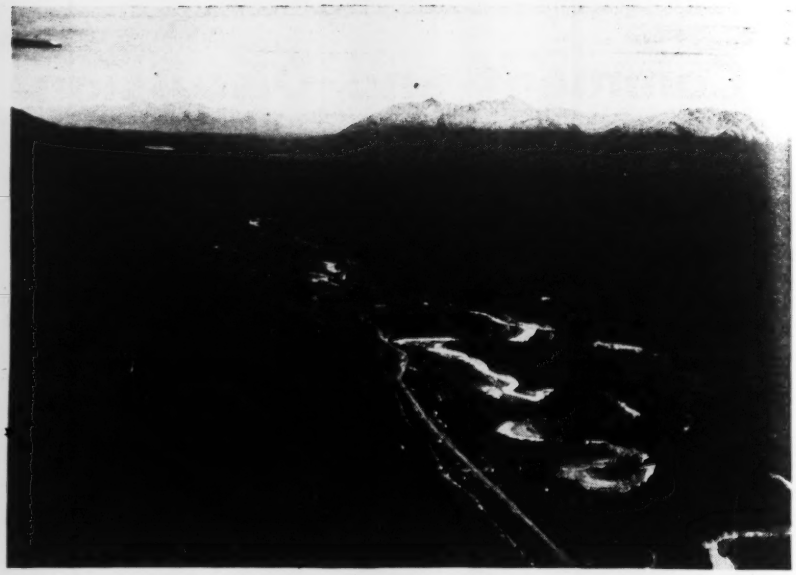
In order to make the picture complete, however, it should be stated that in addition to the Friant-Kern Canal water the district will deliver from the locally available supply the difference between the total requirement and the project supply thus assuring adequate and dependable water at a cost not to exceed $3.50 per acre-ft. canal side. It is estimated that the annual cost per acre per year to the farm turn-out will not exceed $19 at ultimate development, which will include repayment on the distribution system, operation and maintenance and an average water duty of 2.39 acre-ft.

FRED K. WOOLLEY,
Orange Cove Irrigation District Manager, Orange Grove, Calif.

Alaska Highway Location

Sir: In the Sept. 18 issue of *ENR*, vol. p. 404 there is an article on the study of permafrost near Fairbanks, Alaska, in which the statement is made that some 500 miles of the Alaska Highway were relocated because of permafrost. This statement is completely in error, as not a single mile of the highway as built in 1943 has been relocated for this reason.

In the total length of the highway, the mileage of permafrost traversed is nowhere near 500 miles. South of Whitehorse there are only a few places where permafrost is traversed for a short distance. From Whitehorse north to Burwash Landing on Kluane Lake the occurrence is somewhat more frequent. Occurrence is most frequent in the 129 miles from Burwash Landing to the Canadian border where 71 miles (55 percent) of permafrost are traversed. In the 202 miles from the boundary to Big Delta, the northern terminus of construction, 50 miles of permafrost are traversed.



Along Lake Creek the pioneer road was on a side hill where little grading was required, but where icing in winter was certain. The pioneer road can be seen to the left of the completed road in the center foreground.

During construction our engineers estimated that 36 in. of gravel placed over the natural insulating cover above permafrost would provide adequate insulation against melting in summer. Experience has shown this estimate to be correct. Near the end of construction in 1943 circumstances limited the placing of gravel on some short sections to 15 or 20 in. and these sections deteriorated rapidly in 1944. Additional gravel was then placed and the sections have remained in service in good condition.

Every mile of surfacing placed in building the final highway is still in use and there has been no occasion for any relocation. Slides and washouts have occurred but they were not related to permafrost.

Perhaps the statement in your article has its origin in the fact that a pioneer road was constructed in 1942 from which many miles of relocation were made in 1943. When the pioneer road was constructed it was not intended to follow it regularly in building the final highway. Only 503 miles of the pioneer road coincided with the surveyed location line. Subsequently, we were required to follow the pioneer road for an additional 467 miles. Four hundred fifty miles were placed on the selected line not coincident with the pioneer road. The accompanying picture is a typical example of the relation of the pioneer road to the final location.

Possibly it has been assumed that the 450 miles of departure from the pioneer road was because of permafrost. Actually it was to get better grade and alinement. A large portion of the relocation was south of Whitehorse where there is little permafrost. North of Whitehorse relocations crossed about as much permafrost as did the pioneer road.

Permafrost areas caused serious difficulties in establishing advance camps and additional expense in placing gravel fill but there was no loss of work by abandonment of sections of the final road.

R. E. ROYAL,
Chief Division of Research Reports, Public Roads Administration

[Our statement was based on a report prepared in the office of the District Engineer, Corps of Engineers, U. S. Army, St. Paul, which said: "Sliding, cracking and shrinking topsoil along the Alaska Highway necessitated rerouting nearly 500 miles of this roadway in 1943." —EDITORS.]

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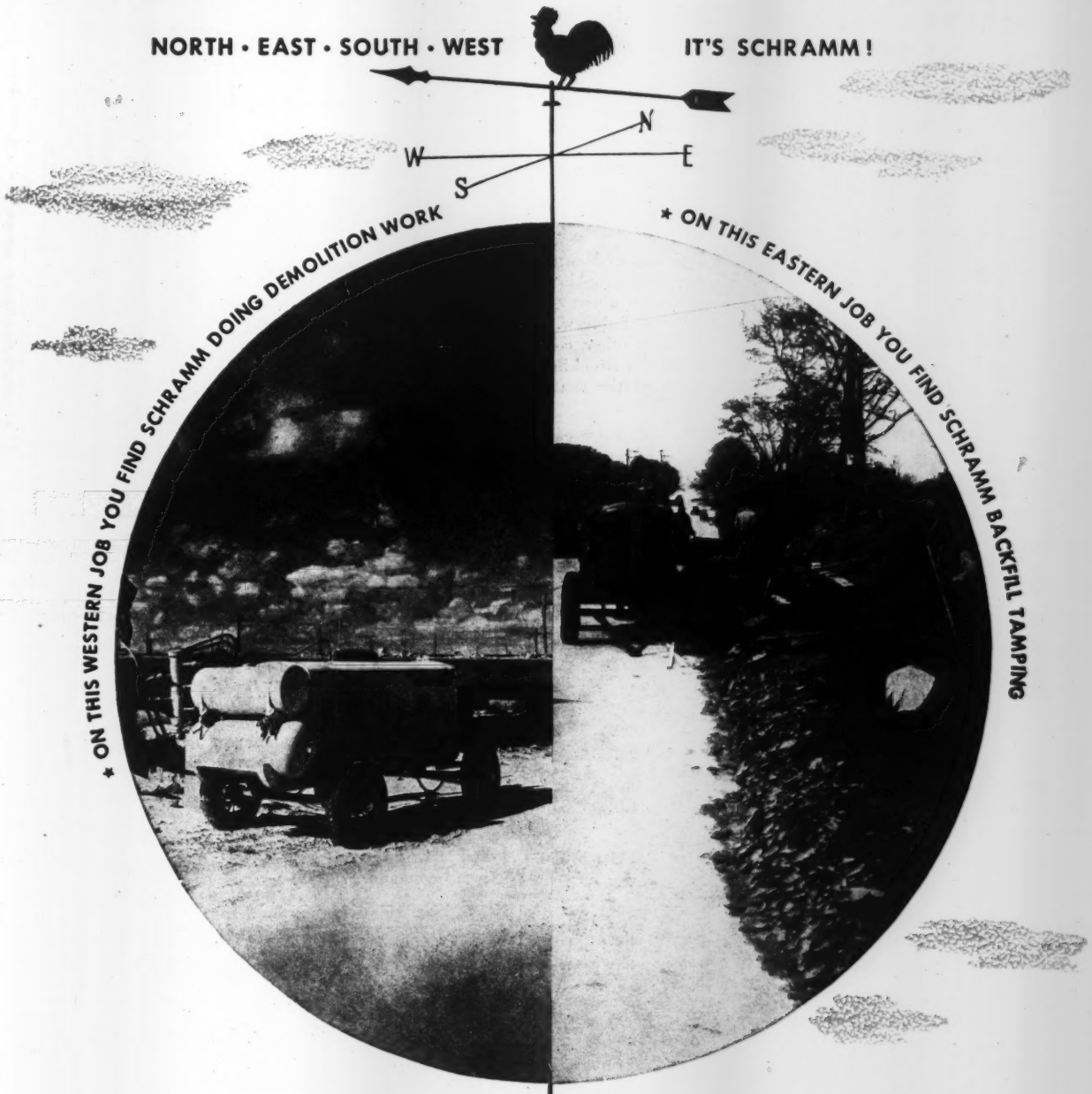

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UNIT PRICES BID BY CONTRACTORS

Aqueduct Tunnel, Boston, Mass.

OWNER: Commonwealth of Massachusetts; Construction Division, Metropolitan District Commission, engineers.

PROJECT: Construction of a tunnel in the cities of Newton and Boston and in the towns of Weston and Brookline, Massachusetts. The work consists of excavating about 4.7 miles of tunnel 12 ft. finished inside diameter, of lining with concrete the tunnels excavated under this and other contracts, of constructing shaft about 240 ft. deep in Brookline and other work incidental to the completion of the shafts and tunnel.

CONDITIONS: All materials are to be furnished by contractor. Access to job site is available by highway. Stipulated contract time is 900 calendar days. Minimum wage rates specified per hr. are: miners, $1.625; bulldozer operators, $1.80; power shovel operators, $2.175; hoisting engineers, $1.80; electricians, $2.15; painters, $1.875; cement finishers, $1.995; common laborers, in tunnel, $1.50; and above ground, $1.40.

BIDS: Four bids were received, ranging from the contract low of $9,529,866.94 to $14,738,677.50. Contract was awarded October 23, 1947.

LIST OF BIDDERS:

1. P. Perini & Sons, Inc., Framingham, Mass. C. J. Maney Co., Inc., Somerville, Mass. Walsh Const. Co., Inc., & Rugo Const. Co., Inc., Boston, Mass. $9,529,866.94
2. V. Barletta Co., Roslindale, Mass. & The Savin Const. Corp., East Hartford, Conn. 10,966,357.08
3. Tunnel Const. Corp. 12,449,228.75
4. S. A. Healy Co., Marinucci Bros. & Co., Boston, Mass. & The Peter F. Connolly Co., Osterville, Mass. 14,738,677.50

	Item	Quantity	Unit Prices (1)	(2)	(3)
1	Earth excavation in open cut	20,000 cy	$2.00	$2.85	$6.00
2	Rock excavation in open cut	3,000 cy	5.00	5.20	10.00
3	Rock excavation in enlarging top of shaft 7	6,000 cy	5.00	5.20	10.00
4	Rock excavation in shaft 7A	2,750 cy	30.00	24.75	35.00
5	Excavation in tunnel	200,000 cy	17.00	24.75	24.45
6	Enlargement of shafts and tunnel	300 cy	22.50	24.75	20.00
7	Clearing	6 ac	600.00	600.00	500.00
8	Pumping from shafts and tunnel	275,000 Mf gal	.15	.20	.10
9	Drainage chan. for shafts, tunnel	31,000 lf	27.00	12.00	40.00
10	Forms for shaft 6	205 lf	160.00	142.00	70.00
11	Forms for shafts 5, 7 and 7A	550 lf	450.00	325.00	200.00
12	Forms for tunnel lining	29,100 lf	25.00	20.00	20.00
13	Concrete in shaft 5 below elev. 30	3,750 cy	25.00	40.00	50.00
14	Concrete in shaft 6	750 cy	35.00	20.00	40.00
15	Concrete in shaft 7 below elev. 115 and 7A below elev. 103	4,000 cy	25.00	18.00	40.00
16	Concrete in tunnel lining	90,000 cy	12.40	21.00	20.00
17	Cyclopean concrete	1,500 cy	30.00	14.00	20.00
18	Concr. in bldg. at top of shaft 5	1,300 cy	60.00	30.00	51.00
19	Concrete in valve chambers at tops of shafts 7 and 7A	900 cy	50.00	35.00	40.00
20	Concrete not included in items 13 to 19 inclusive	400 cy	77.00	50.00	50.00
21	Excess concr. (fixed price, $5.00)	1,000 cy	5.00	5.00	5.00
22	Structural steel support	150,000 lb	.20	.20	.15
23	Timbering in shafts and tunnel	350 Mbm	240.00	150.00	200.00
24	Miscellaneous timber and lumber	50 Mbm	325.00	200.00	250.00
25	Dry packing	2,000 cy	8.00	12.00	15.00
26	Drilling holes in rock or masonry	3,000 lf	1.00	2.00	1.50
27	Steel pipe for grouting	8,000 lf	1.25	.50	1.50
28	Connections for grouting	4,000 ea	3.00	2.00	7.50
29	Sand for grout and protective coating	1,000 cy	5.50	3.00	5.00
30	Mixing and placing grout	8,000 cy	16.50	15.00	15.00
31	Protect. coating of cmt. mortar	100 cy	35.00	50.00	40.00
32	Portland cement	210,000 bbl	3.75	3.50	3.50
33	Reinforcing steel	950,000 lb	.10	.10	0.12
34	Miscel. refilling and embanking	15,000 cy	.70	.75	1.50
35	Consolidated refill	4,000 cy	2.00	1.25	2.00
36	Mortar linings, 2" or less	14,000 sf	4.00	2.50	2.50
37	Removal and storage of soil	15,000 cy	1.00	1.00	1.00
38	Cast-iron pipe and fittings	300,000 lb	.25	.15	.25
39	Steel plate pipe and linings	1,000,000 lb	.35	.35	.30
40	Miscel. c. i., w. i. and steel	80,000 lb	.60	.70	.70
41	Galvanising	60,000 lb	.07	.10	.05
42	Miscellaneous non-ferrous metals	8,000 lb	1.75	2.00	1.00
43	Caring for and setting metal work	700,000 lb	.07	.10	.10
44	Paving	50 cy	15.00	20.00	40.00
45	Stone masonry	200 cy	255.00	100.00	200.00
46	Crushed stone, gravel and sand	750 cy	5.00	3.50	8.00
47	Temporary fencing	5,000 lf	2.50	2.00	2.50
48	Permanent fencing	500 lf	3.00	2.50	3.00
49	Drain pipe, not exceeding 12"	300 lf	2.00	3.00	3.00
50	Drain pipe, over 12" and not exceeding 24"	50 lf	3.50	4.00	7.00
51	Brick masonry	150 cy	200.00	75.00	100.00
52	Medical and hospital services	30 mo	1,000.00	2,000.00	3,000.00
53	Sanitary services	30 mo	2,500.00	2,000.00	2,500.00
54	Hypochlorite of lime	1,000 lb	1.00	.10	.10
55	Locker houses at shafts 5 and 7A	lump sum	15,000.00	26,000.00	20,000.00
56	Maint. and serv. locker houses	120 house mo	125.00	300.00	200.00
57	Reinforced-concrete pressure pipe	2,500 lf	60.00	60.00	80.00
58	Steel castings	170,000 lb	.65	.50	.50
59	Surface dressing of top soil	16,000 cy	1.50	1.00	2.00
60	Seeding and grassing	20 ac	750.00	200.00	1,000.00
61	Construction of shafts 5, in addition to other items	lump sum	75,000.00	60,000.00	200,000.00
62	Construction of shafts 6, 7, 7A, in addition to other items	lump sum	10,000.00	20,000.00	100,000.00
63	Clean. and restor. of grounds	lump sum	10,000.00	20,000.00	75,000.00
64	Furnishing performance bond, rate per $1,000		7.50	8.00	15.00

Airport Improvements, Georgia

OWNER: Muscogee County, Columbus, Georgia; Robert and Co., Assoc., Inc., engineers.

PROJECT: Complete construction of taxiways and extension of paved apron at existing airport. Work includes all clearing, grubbing, excavation and embankment construction, and excavation for sight line. Revisions to be made to existing storm drainage facilities and construction of new drainage facilities. Construction of base, bituminous pavement, turfing and reshaping certain areas.

CONDITIONS: All materials are to be furnished by the contractor. Access to job site is available by both rail and highway. Stipulated contract time is 120 working days. Prevailing skilled labor wage rate is $2.00 per hr., semi-skilled, $1.00 per hr.; and common, $.75 per hr.

BIDS: Five bids were received, ranging from the contract low of $172,750.58 to $186,684.43. Contract was awarded September 26, 1947.

LIST OF BIDDERS:

1. Wright Contracting Co., Columbus, Ga. $172,750.58
2. Hugh McMath Const. Co., Columbus, Ga. 178,873.45
3. Hardaway Contracting Co., Columbus, Ga. 179,281.48
4. Mac Dougald Constr. Co., Atlanta, Ga. 185,674.30
5. Hewitt Contracting Co., Columbus, Ga. 186,684.43

	Item	Quantity	Unit Prices (1)	(2)	(3)
1	Clearing and grubbing—9 acres	lump sum	$4,000.00	$1,000.00	$1,000.00
2	Unclassified excavation	166,362 cy	.246	.23	.30
3	Reshaping	86,266 sy	.02	.03	.03
4	Storm drain—15"	1,030 lf	2.50	2.10	2.00
5	Storm drain—18"	950 lf	3.00	2.90	2.50
6	Storm drain—24"	2,396 lf	4.50	5.10	4.00
7	Storm drain—30"	2,550 lf	6.00	6.90	6.00
8	Storm drain—36"	1,508 lf	7.50	9.35	9.00
9	Storm drain—42"	650 lf	10.50	11.65	12.00
10	Corr. metal pipe (spillways)—10"	260 lf	2.00	1.75	1.50
11	Concrete for drainage structures	164 cy	70.00	60.00	60.00
12	Drop inlet frame & grate—Type I	25 ea	120.00	100.00	15.00
13	Drop inlet frame & grate—Type II	10 ea	220.00	190.00	30.00
14	Remove existing drop inlet	4 ea	25.00	35.00	20.00
15	Remove existing storm drain	140 lf	1.50	1.25	2.00
16	Remove existing headwalls	2 ea	25.00	25.00	10.00
17	Plain concrete (spillways)	13 cy	30.00	30.00	40.00
18	Riprap	15 sy	6.00	5.00	5.00
19	Subbase construction	6,950 cy	.49	.98	.90
20	Sand-clay base course—8"	11,640 cy	.63	.98	.90
21	Bituminous prime coat	17,475 gal	.19	.195	.18
22	Bituminous surface course—2"	4,993 ton	6.50	6.88	6.50
23	Bituminous seal coat	9,986 gal	.16	.15	.15
24	Cover aggregate for seal coat	349 ton	6.50	6.50	6.50
25	Turfing—areas "A"	87.5 ac	70.00	45.00	60.00
26	Turfing—areas "B"	14.7 ac	80.00	47.50	70.00
27	Mowing	87.5 ac	5.00	3.00	5.00
28	Refertilising	20 ac	15.00	22.50	20.00

Elections and Activities

C. Dwight Curtiss, deputy commissioner of the Public Roads Administration, Federal Works Agency, has been elected president of the District of Columbia section of the American Society of Civil Engineers, succeeding William G. Hoyt, executive officer of the Water Resources Committee, Department of Interior. Byron Bird, chief of the engineering division of the Washington district office of the Corps of Engineers, U. S. Army, is the new vice-president and Waldo E. Smith, executive secretary of the American Geophysical Union, National Research Council, the new treasurer. Charles J. Stevens, architectural engineer in the construction department of the Navy's Bureau of Yards and Docks, was reelected secretary. New directors are: Edward Wenk, Jr., of the David Taylor Model Basin, Carderock, Md.; Kenneth L. Roberts, Federal Power Commission; Deputy Commissioner Kenneth W. Markwell of the Bureau of Reclamation, and T. Ritchie Edmonston of the E. P. Knollman construction firm, Washington, D. C.

Certificates of life membership in the society were awarded to 15 members, including: James P. Alvey, in charge of Washington, D. C. office of Bonneville Power Administration; Wm. J. Barden, retired colonel of the U. S. Army; Ralph R. Benedict, highway engineer with the PRA; Wm. B. Bennett, vice-president and secretary of the Capital Transit Co.; Roy W. Crum, director of the Highway Research Board since 1928; Walter L. Drager, former acting chief engineer of the Self-Liquidating Division, Reconstruction Finance Corporation, and now retired; Daniel C. Hayne, senior natural gas engineer in the Federal Power Commission; Wm. G. Hoyt, executive officer of the Water Resources Committee, Department of Interior; and Edwin W. James, chief of PRA's Inter-American Regional office.

Other men given life certificates were: Frank E. Lamphere, assistant chief engineer of the Defense Plant Corporation; Hugh Miller, Office of the Chief of Engineers, U. S. Army; Ernest J. Newton, formerly with the Corps of Engineers for many years and now retired; Col. James G. Steese, assistant to the Governor, Panama Canal, and to the president of the Panama Ry. Co.; and Stanley H. Wright, now employed on special studies and analyses for the Bureau of the Budget.

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Gooseneck Trailers
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Pictured here is the Rogers Type D, eight rear wheel, two-way oscillating axle trailer. This trailer readily conforms to roadbed irregularities. Eliminates any tendency toward deck weaving or distortion.
Rogers time-tested and universally approved trailers for heavy and unusual hauling, are all products of exceptional engineering skill, acquired over a period of more than 32 years.
Progressive evolution has produced a complete line of trailers UNCOMMONLY STRONG but COMPARATIVELY LIGHT. They may be loaded easier and moved through traffic with greater speed and safety. They render exceptionally long periods of service with remarkable freedom from repair expense. AN IMPRESSIVE RECORD OF REPEAT ORDERS stands as convincing evidence of Rogers long and continued acceptance.
Shown above and at right are two views of the Rogers Walking Beam Trailer. Side swinging brackets permit operation with 8 or 10 ft. deck widths to conform to certain state requirements.
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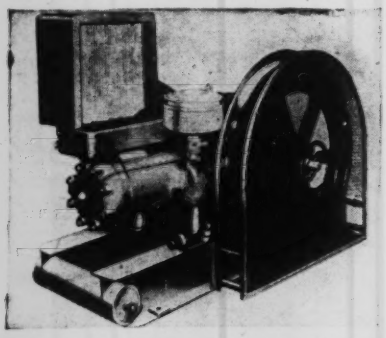
New Aids to the Constructor

MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS

(Number refers to item directly below it)

103

MULTI-FUEL ENGINES — Lorain Type L heavy-duty single-cylinder, horizontal, two-cycle engine will operate on diesel fuel, natural gas or butane. It has rating of 10.7 hp. at 300 rpm. and 21.4 hp. at 600 rpm. It has 7½-in.



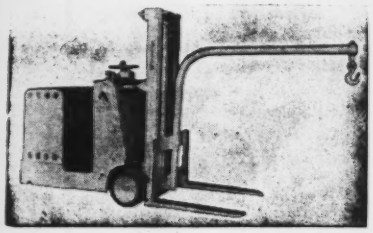
bore and 8-in. stroke with Timken bearings on crankshaft and crossshaft. Standard equipment includes Twin Disc clutch, Pierce governor, Air Maze oil bath type cleaner, and McCord lubricator. Engine is 52½ in. high, 70 in. long and 47¼ in. wide. Shipping weight is 2500 lb.—*White-Roth Machine Corp., Lorain, Ohio.*

104

TWO-WHEEL TRACTOR — Two-wheel, full traction diesel-powered tractor is designed to pull Heil 16-yd. scrapers and 18-yd. bottom-dump wagons. Hydraulic power steering, controlled by conventional steering wheel, may be assisted by individually hand-controlled air-operated wheel brakes. Engine develops 150 hp. at 1,900 rpm. Overall dimensions: length, 14 ft. 9½ in.; width, 9 ft. ⅞ in.; height, 9 ft. 8½ in.; tread, 82 in. Tractor has four speeds forward, plus overdrive and reverse. Maximum travel exceeds 20 mph. Unit weighs about 16,500 lb.—*The Heil Co., Milwaukee 1, Wis.*

105

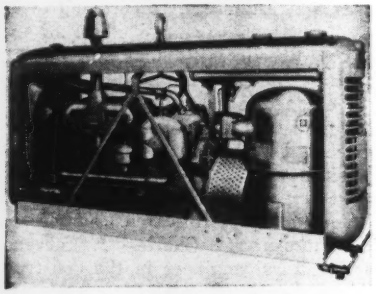
CRANE ARM ATTACHMENT—Constructed of tubular steel, new crane arm is available in lengths from 24 in. to 6 ft. in 6-in. increments to fit all models of Lewis-Shepard power



fork trucks. Material is picked up with sling attached to rugged crane hook. After load is secure it can be moved by crane arm or placed on pallet or skid platform for transportation by fork-lift truck.—*Lewis-Shepard Products, Inc., 301 Walnut St., Watertown 72, Mass.*

106

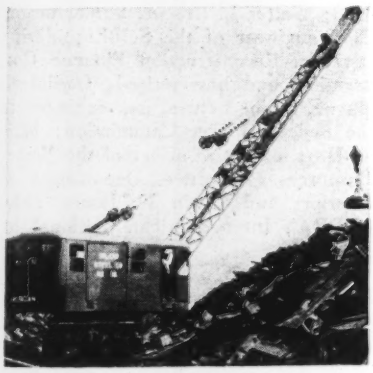
COMPRESSOR—New Airmaster compressor, known as 105 utility, weighing 1,700 lb., has been specifically designed for either back of cab or on platform of utility trucks. Floor area required is only 82x25 in. Engine used is Le Roi D226 featuring replaceable cylinder sleeves, precision bearings, overhead valves, pressure lubrication and mag-



neto ignition. Liquid cooled compressor is built integrally into engine block. It is regulated by Le Roi patented Econotrol which governs compressor capacity automatically according to demand for air. Lifting bail, 6-v. electric starting system, and electric hour-meter on centralized control panel are supplied as standard equipment.—*Le Roi Co., 1706 S. 68th St., Milwaukee 14, Wis.*

107

LOCOMOTIVE CRANE—New Diesel-electric locomotive crane has 40-ton capacity. Electric power is used to travel crane along rails, while direct diesel power operates turntable and load lifting mechanism. In addition to hook work, it is used with grab



bucket, grapple, car switching and magnet, which is energized from traction generator. Electrified drive, which eliminates many major moving and wearing parts, is said to cut maintenance as much as 50 percent. —*American Hoist & Derrick Co., St. Paul, Minn.*

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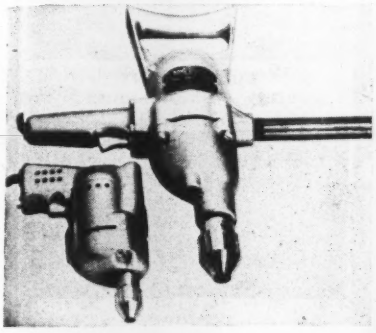
blades, held in place with two large setscrews, and revolver-type handle.—*Great Neck Saw Mfrs., Inc., Mineola, N. Y.*

111

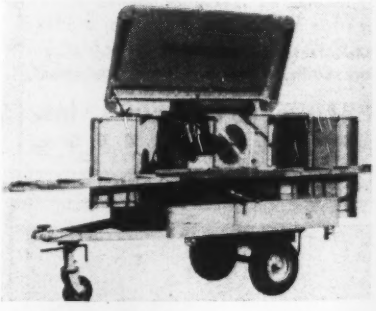
PORTABLE ELECTRIC DRILLS—Powered by universal motors, which use either a.c. or d.c., drills are available in two capacities, ¼ and ½ in. They drive twist drills, wood drills,



hole saws, countersinks, wire brushes, abrasive pads and sleeves. They have strong, light, die-cast aluminum housings, instant-release trigger switch, Jacobs chucks, three-wire electric cord for ground connection. Bench stands for each model convert drills into convenient drill presses.—*Black & Decker Mfg. Co., Towson 4, Md.*

112

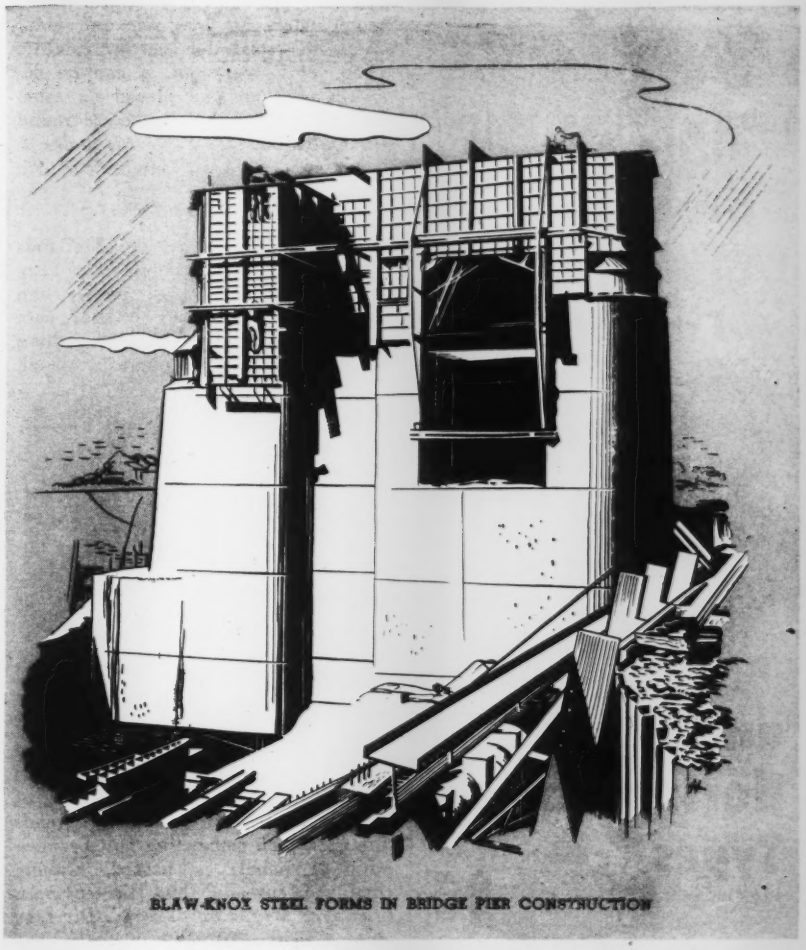
PORTABLE SHOP—A "pre-fabricating plant" on wheels is the first portable shop of its kind. A radial arm type wood-working saw is mounted on wheels; it can be attached to any car or truck and taken to the site for on-



the- job cutting. Millwork of many types can be done inside the structure as the shop rolls through any standard door. The deluxe model is shown; the standard model has a heavy duty, tarpaulin (zipper-closed) cover.—*Equipment Engineering Co., St. Charles, Ill.*

113

DETACHABLE MOIL POINT—Forged of two different types of steel, new moil point has shank made of



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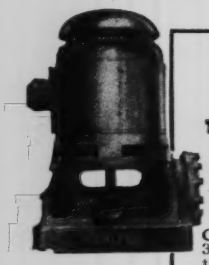

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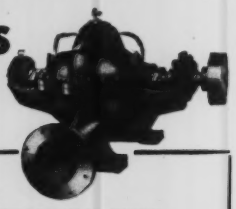

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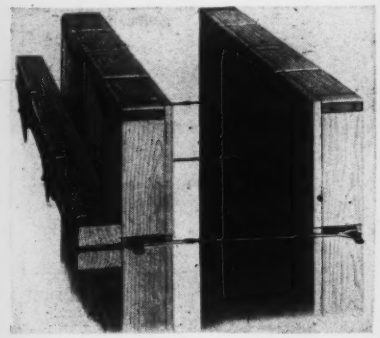
"tough" steel for long life and point of "hard" steel for cutting ability. When point wears out, it can be detached and new one placed on same shank. Old point can be reground by any workman.—*Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa.*

114

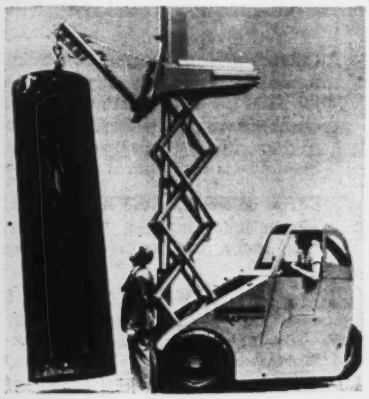
PANEL FORM SYSTEM—Tie rods in standard panel (2-ft. wide) are anchored from sides of panels and hold both ways. They do not pass through, therefore there is no fishing for tie openings in opposite panel.



Drilling for ties and plugging up old tie holes is eliminated. Tie rod has break back feature and, instead of spreader washers, has looped ends through which connecting bolt between adjacent panels is passed, making combined spreader and tie.—*Symons Clamp & Mfg. Co., 4249 W. Diversey Ave., Chicago 39, Ill.*

115

LIFT TRUCK—Heavy-duty lift truck features hydraulic lift that will handle 6,000 lb. to height of 8 ft. or 4,000 lb. to 11 ft., yet collapse completely into truck body like bellows of camera. Wagnermobile lift weighs 7,425 lb.



with fork and boom. It works comfortably inside freight cars or in other narrow, tight quarters. Quick-change attachments make possible handling of wide variety of heavy or bulky materials.—*Mixermobile Mfrs., 6855 N. E. Halsey St., Portland 16, Ore.*

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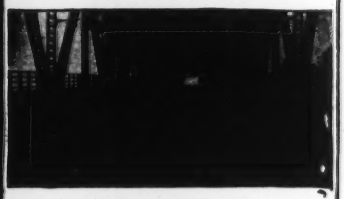

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Manufacturers' Publications

116

Power Hoists—(12-p. bulletin) Describes and pictures heavy, medium and light-duty single and double-drum hoists. Formula is given for calculating rope capacity of drum.—*Domestic Engine & Pump Co., Shippensburg, Pa.*

117

Rubber-Tired Tournadozer—(23x33-in. folder) Illustrates and describes new model C Tournadozer, showing how it can be used on stockpiling, backfilling, push loading and stripping. Design features are explained by large job action photos.—*R. G. LeTourneau, Inc., Peoria, Ill.*

118

Wrought Iron—20-p. booklet) Tells in non-technical terms what wrought iron is, why it resists corrosion and withstands shock and vibration, how it is made, and how it is bent, welded and threaded. Various service for which wrought iron pipe and plates are used are also depicted.—*A. M. Byers Co., Pittsburgh, Pa.*

119

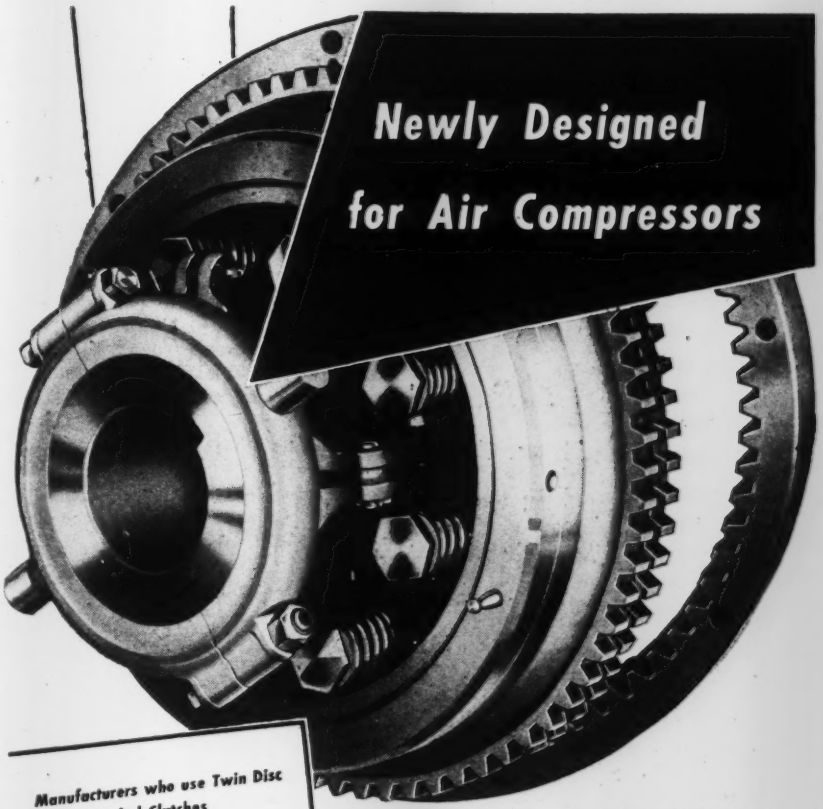
Electric Plants — (16-p. catalog) Gives helpful information and assistance in plant selection to potential users of electric generating plants, describing sizes ranging from 350 to 35,000 w. a. c. in all standard voltages, frequencies and phases.—*D. W. Onan & Sons, Inc., Minneapolis 5, Minn.*

120

Water Treatment—(94-p. technical bulletin) Has sections on softening, purification, tests and odor removal, corrosion control, boiler feed water treatment, use of alkalies, chlorine and other chemicals and equipment, as well as lists of standard reference works on subject.—*Solvay Sales Corp., 40 Rector St., New York 6, N. Y.*

121

Pillow Blocks—(8-p. folder) Provides information about light series pillow blocks, flange cartridges and cylindrical cartridges equipped with sealed wide inner ring ball bearings. Photographs, sectional drawings, specifications and load ratings are included. —*Fafnir Bearing Co., New Britain, Conn.*



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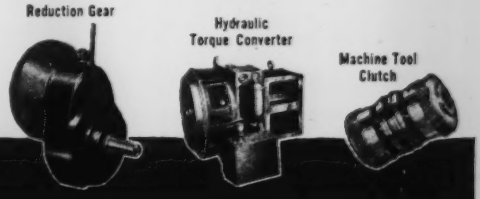

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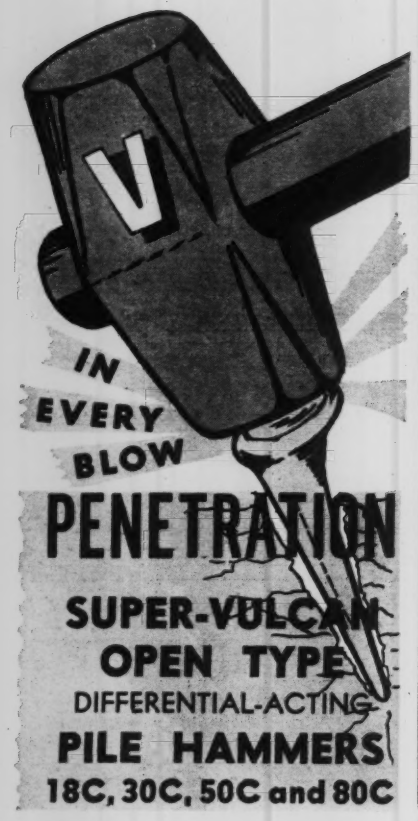

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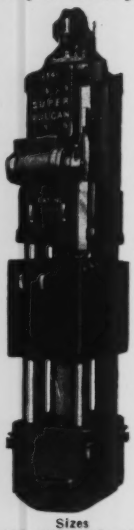

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122

Gunite—(48-p. booklet) Features adaptability of pneumatically applied sand and cement to all forms of new construction, and maintenance and repair of existing structures. General physical properties, method for application, and specifications are given.—*Pressure Concrete Co., 193 Emmet St., Newark, N. J.*

123

Air Compressors—(new leaflet)—Describes Air Chief line of industrial air compressors, with mechanical data and specifications on complete Davey departmental units of 60-105-160-210 and 315 c.f.m. It also lists bare compressors suitable for installation with customers' motors or as replacement machines.—*Davey Compressor Co., Kent, Ohio*

124

Rock Jack—(5-p. booklet) Describes and gives operating instructions and specifications for Duncan Roc-Jak and pump for breaking mass concrete and rock without blasting.—*Vermont Tool & Supply Co., 2425 E. 37th St., Los Angeles 11, Calif.*

125

Welding for Equipment Salvage—(8-p. technical bulletin) Describes specific procedures involved in industrial equipment salvage welding with various gas and arc rods for producing hard overlay at low temperature. Several interesting new alloys for hard overlay process are featured in charts, data and photographs.—*Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.*

126

Rust-Inhibitive Coating—(4-p. folder) Points out advantages of application of new Rockcote zinc chromate on all structural steel, as well as aluminum and aluminum alloy building materials. Inks used in folder are red, green and yellow, matching the three colors of coating.—*Rockford Paint Mfg. Co., Market & Madison Sts., Rockford, Ill.*

127

Locomotive Diesels—(Special bulletin) Includes factory photographs that shows how diesels are built, with photographs of engines, specification tables and dimensional blueprints. Also included is list of standard and special equipment for various engines.—*Superior Engine Division, National Supply Co., Springfield, Ohio.*

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Men and Jobs

W. W. Brenner, former division engineer on the Bureau of Reclamation's Gila Project in Arizona, is now construction engineer for the Heart River Unit of the Missouri Basin Project. He will direct construction on the Heart Butte and Dickinson dams and other works of the Heart River unit, which is designed to provide irrigation water for approximately 14,000 acres of land, retain and utilize flood waters, provide water for use by a municipality and provide for silt detention.

William J. Wolf, chief of operations and maintenance for the Buffalo, N. Y., district office of the U. S. Engineers, has been promoted to head engineer. This district is the only one with two head engineers on its staff, as Lieut. Col. Harland C. Woods, technical assistant to the district engineer, also holds the rating. Mr. Wolf received his civil engineer's degree from Michigan State College, 1913, and then joined the U. S. Lake Survey in Detroit. Six years later he joined the U. S. Engineers in Buffalo as a junior engineer. In 1941 he was appointed chief of engineering and operation.

J. B. Nelson has been appointed resident engineer for the Alabama State Highway Department in Madison County. He was formerly a civil engineer at the government arsenal in Huntsville and prior to that was Calhoun County engineer for 15 years.

The Alabama State Highway Department has re-established the Bureau of Bituminous Operations, discontinued several years ago, and Highway Director Ward McFarland has announced appointment of **Theo Massey** as head of the bureau. The bureau will design all bituminous pavements, and select materials for new highways and the type of pavement for construction and maintenance on existing highways.

Walter E. Ducker is the first traffic engineer of St. Petersburg, Fla. He has been with the city for a year and a half following and has handled most of the planning and designing of streets.

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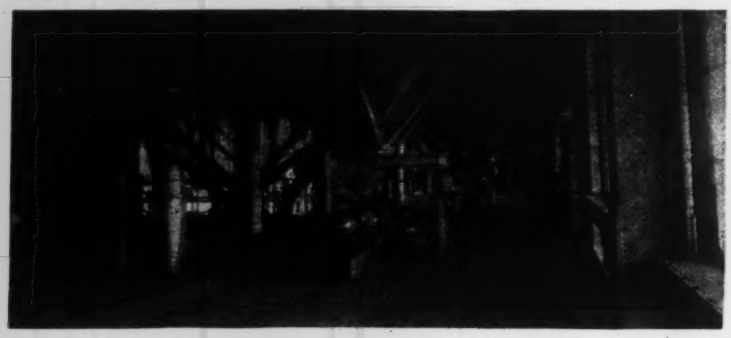

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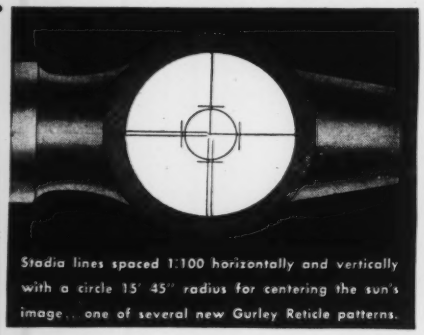

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Manufacturers' Activities

Current developments among manufacturers relating to expansion of services, shifts in personnel, and other changes, include the following:

Sales Staff Changes—THE GORMAN-RUPP CO., Mansfield, Ohio, appointed H. W. Vine as manager of industrial sales. . . . Murray H. Owen has been appointed manager of sales for the GENERAL ELECTRIC CO.'s wire and cable division at Bridgeport, Conn. . . . The diesel engine division of ENTERPRISE ENGINE & FOUNDRY CO. announced that Glenn Harris, formerly of the home sales office in San Francisco, Calif., has taken charge of a branch office at Omaha, Neb. . . . . F. R. Meyers has been appointed district sales manager for the states of Missouri, Kansas and southwestern Illinois by the MURPHY DIESEL CO. of Milwaukee, Wis. . . . James A. Old is now sales manager of the hardware products department for Wickwire Spencer Steel Division of the COLORADO FUEL & IRON CORP. . . . SMITH-GILES CO., factory fabricated buildings manufacturers' representative in Chicago and Minneapolis added Robert Ornberg to their staff. . . . THE SOLVAY SALES CORP. announced appointment of Neal M. Draper as manager of its St. Louis branch.

Dealer Appointments — James S. Emerick, Detroit, has been named sales representative for lower Michigan for the PENNSYLVANIA REFINING CO. . . . THOMPSON SAGE, INC. have been named sales agents for Lima excavators in the territory surrounding Stockton, Calif. . . . PORTABLE TOOL SALES AND SERVICE, INC., Chicago, has been appointed an authorized Davey Compressor dealer. . . . O. T. CHRISTERSON CO., Chicago, are exclusive agents in the Chicago and northern Illinois territory for the RALPH B. CARTER CO. . . . DRAVO-DOYLE CO., Pittsburgh, Pa., suppliers of constructors' equipment, opened a branch office in Cleveland, Ohio. . . . CATAPHOTE CORP., appointed D. B. Groce as representative for highway signs and markers in Ohio and Michigan. . . . The Tournalayer Sales Division of R. G. LETOURNEAU, INC. announced opening a division office in Los Angeles, Calif.

Personnel Shifts — Integration of manufacturing processes by the current general plant expansion has resulted in appointment of Lloyd J. Ely, John Elwood and Arthur W. Johnson as fac-

tory managers in charge of phases of manufacturing operations for the CATERPILLAR TRACTOR CO. . . . M. S. Larrison is now superintendent at the CHARLES BRUNING CO., INC. plant at West Orange, N. J., and A. H. Stuart is director of research. . . Organization of a public relations bureau for the PORTLAND CEMENT ASSOCIATION was announced, with Hubert C. Persons as manager. . . . Frank W. Taylor has been appointed public relations directo for the CELOTEX CORP., Chicago, Ill. . . . William E. Simons, formerly sales manager of the Truck Body and Hoist Division of the HEIL CO., has become general manager of the division, as well as the Road Machinery and Service division. . . . Alexander La Penna has been named general parts manager for the H. O. PENN MACHINERY CO. . . . Personnel changes in the Tar Products Division of KOPPERS CO., INC., include appointment of H. B. Cummings as manager of the planning and procurement department; R. C. Stromquist, manager of the production department, and R. R. Holmes manager of the sales department. . . . Edwin A. Murray and Howard M. Boteler have been appointed assistant managers of the compressor division of the WORTHINGTON PUMP & MACHINERY CORP. at Buffalo, N. Y.

Miscellaneous — The "QUICK-WAY" TRUCK SHOVEL CO. of Denver, Colo., has announced plans for construction of a new building to cost about $100,000 to house additional manufacturing facilities. . . . THE CATERPILLAR TRACTOR CO., Peoria, Ill., has plans for construction of a new factory to house facilities for manufacture of diesel wheel type tractors. . . .THE LIMA LOCOMOTIVE WORKS, INC., Lima, Ohio, and the GENERAL MACHINERY CORP., Hamilton, Ohio, will henceforth operate under the name of LIMA-HAMILTON CORP., with the following divisions: Lima Locomotive division, Lima Shovel and Crane division, Hooven, Owens Rentschler Co., and Niles Tool Works Co. . . . THE HINDERLITER TOOL CO. division of the H. K. PORTER CO. INC., Tulsa, Okla., has announced acquisition of all manufacturing rights for "Nail-It" mud guns, and "Nail-It" swivel joints and pump suction couplings.

Cloud Wampler, president of CARRIER CORP., has announced acquisition of title to the huge industrial plant at Syracuse, N. Y., that was built by the U. S. Navy in 1942. The purchase was made from War Assets Administration as a part of Carrier's $12,000,000 expansion program for the manufacture of air conditioning and refrigeration equipment.

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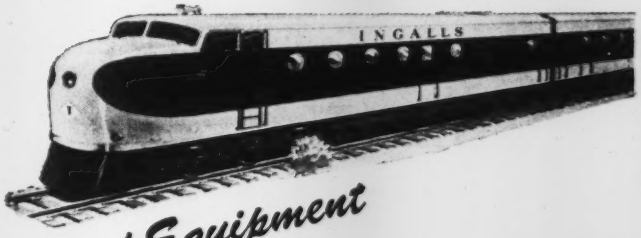

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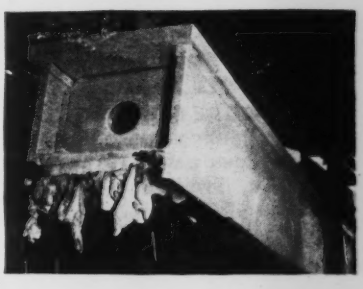

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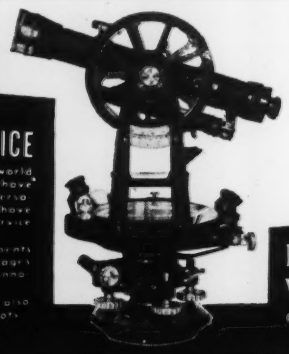

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ELSIE EAVES, Manager J. A. MAHONEY, Reports E. R. BIGGERSTAFF, M. R. ROESSLER, Statistics

WATER SUPPLY

PROPOSED WORK

●**Calif., Vallejo**—City, City Hall, receiving reservoir for water from gravity canal from Monticello Dam on Putah Creek, pumping plant, pipeline and treatment works. **$2,000,000.** T. D. Kilkenny, city engr.

Miss., Columbus—City, T. W. Lewis, Jr., clk., Columbus, bond election Dec. 16, WW sys. **$650,000.** CD 12/3/46—ENR 12/12/46.

Tenn., Springfield—Springfield Utility Comn., 2¼ m.g. daily capacity filtration and pumping plant, 300,000 gal. elevated storage tank, and 5,500 ft. 8- and 10-in. mains. **$400,000.** Howard K. Bell, 553 S. Lime St., Lexington, Ky., consult. engr.

Tex., Brady—City, F. R. Wulff, member Advisory Bd., addnl. water distr. sys. imprvs. and water supply. **$400,000.**

Tex., Pasadena—City, Sam Hoover, mayor, will not hold bond election Feb. 16, water supply wells, **$70,000;** ground tanks, reserve water storage tanks, **$125,000;** c.i. mains, **$95,000;** A. B. Moore Eng. Co., P. O. Box 11, Pasadena, consult. engr. CD 11/24—ENR 12/11.

Wash., South Cle Elum—Town, Town Hall, voted bonds, water supply and distr. sys. **$100,000.** CD 11/10.

Wash., Tacoma—City, City Hall, 3 wells. **$140,000.** W. A. Kunigk, water supt.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Calif., Patterson—City, City Hall, sewerage sys. **$100,000.** W. F. Woolley, City Hall, city engr.

●**Ill., Belleville**—City, Ernest W. Tiemann, mayor, City Hall, sewage treatment plant, incl. auxiliaries, appurtenances, sanitary and storm water sewer extens., imprvs. **$1,050,000.** Russell & Axon, 408 Olive St., St. Louis, Zone 2, Mo., consult. engrs. CD 4/8/46.

Mich., Portland—Village, sewage treatment plant. **$142,600.** Francis Eng. Co., Eddy Bldg., Saginaw, consult. engr.

Minn., Ellsworth—Village, J. M. Magee, clk., voted **$114,000** bonds, storm and sanitary sewers, sewage disposal plant, P. C. Bettenburg & Co., 1437 Marshall Ave., St. Paul, consult. engrs. CD 3/7/46—ENR 3/21/46.

●**Neb., Omaha**—City, addnl. sewer construction. **$3,961,500.** E. W. Woodbridge, Omaha, city engr. CD 7/31—ENR 8/21.

●**N. J., Ewing-Lawrence Twps.**—Ewing-Lawrence Joint Sewerage Auth., Ewing or Lawrence Municipal Bldgs., plans by Mickelwright & Mountford, 72 Ewing St., Trenton, sewage treatment plant; plans approx. 30 mi. sewers for Ewing Twp. and 51 mi. for Lawrence Twp. **$3,991,000.** B. Frank Stratton, 143 E. State St., Trenton, engr.

N. C., Kinston—Town, voted bonds sanitary and storm sewers. **$320,000.** CD 11/12—ENR 11/27.

O., Farmersville—Village, voted bonds sewer imprvs. **$230,000.** CD 10/29.

O., Sheffield Lake—City, voted bonds, main sewer in Lake Rd. **$165,000,** CD 10/28; imprvs. at sewage treatment plant, **$105,000,** CD 10/29.

Pa., Bridgewater—Bridgewater Boro, Boro Bldg., plans by Michael Baker, Jr., Rochester, 3,000 ft. 8- and 10-in. sanitary sewers and 3 pumping stations. **$175,000.**

Pa., Freedom—Freedom Boro, Boro Hall, plans by Michael Baker, Jr., Rochester, sewage treatment and sewage facilities, complete sys. for water facilities and sewage treatment. **$100,000.** CD 3/3—ENR 3/20.

●**Tex., Dallas**—City, Earl Goforth, secy., voted bonds, sanitary sewer lines. **$7,500,000.** Roderic B. Thomas, city engr. CD 11/12.

●**Tex., Lubbock** — City, Homer A. Hunter, mgr., voted bonds, addnl. sanitary sewer lines and sys. imprvs. **$841,000;** sewage disposal plant, **$450,000.** Homer A. Hunter, city engr. CD 11/10.

Tex., Pasadena—City, Sam Hoover, mayor, will not hold bond election Feb. 16, disposal plant, **$90,000,** Garrett Eng. Co., 1806 Milan St., Houston, consult. engr.; sanitary sewer lines, **$175,000,** A. B. Moore Co., Box 11, consult. engr. CD 11/24—ENR 12/11.

●**Tex., San Antonio**—City, James Knight, Street Comr., voted bonds, main sewer arteries, **$5,000,000;** sewage disposal plant enlargement, **$600,000;** flume across San Antonio River, **$400,000.** Thomas Coghill, city engr. CD 11/19—ENR 11/27.

Tex., Wharton—City, Frank Haines, mayor, voted bonds, sanitary sewer lines, **$212,000;** sewage disposal plant, **$100,000;** storm sewers, **$70,000.** Wyatt C. Hedrick, 5201 Fannin St., Houston, consult. engr. CD 11/20—ENR 11/27.

Ont., Port Elgin—Town, sewerage sys. alterations, addns. Approx. **$200,000.** G. G. Reid, 264 Avenue Rd., Toronto, engr. CD 10/17—ENR 10/30.

B. C., Kimberley—City, sewerage sys. **$400,000.**

BRIDGES

PROPOSED WORK

Mo., Jefferson City—City, H. W. Els, clk., City Hall, voted $225,000 bonds, 600 ft. rein.-con. viaduct on High St. and Walnut Sts. bridge. **$640,000.** CD 11/10—ENR 11/27.

Neb., Sidney—State Dpt. Rd. & Irr., Sidney, underpass at U. P. R. R. tracks. **$400,000.** Cost to be borne by Federal Gov., State, and City. W. G. Scott, Lincoln, state engr.

●**Wis., Milwaukee**—City, bridge over Kinnickinnic River and E. Greenfield Ave. **$5,000,000-$8,000,000.** Manuel C. Cutler, city engr. CD 1/9/46—ENR 1/24/46.

Quebec—Province of Quebec, Quebec City, 30 ft. vehicular bridge over Quebec Bridge, **$1,750,000;** reconstructing approaches to Quebec Bridge on both south and north shores, **$300,000;** replacing Garneau Bridge over Chandiere River, **$1,000,000,** all foregoing Quebec City. Dpt. P. Wks., Quebec City, engr.

●**Que., Quebec City**—Canadian National Rys., B. Wheelwright, ch. engr., 360 McGill St., Montreal, double width of main traffic way on Quebec Bridge, imprv. traffic facilities between north and south shores of St. Lawrence by widening 15 ft. trafficway to 30 ft. using space intended for addnl. railway line. Approx. **$7,500,000-$8,000,000.**

Saskatchewan—Province of Saskatchewan, Regina, bridge construction at Saskatchewan Landing, Swift Current. **$100,000.** Dpt. Hys., Regina, engr.

STREETS AND ROADS

PROPOSED WORK

Georgia—State Hy. Dpt., Atlanta, paving 9½ mi. Jackson Short Route, Bibb. Co. Over **$100,000.**

Ia., Bloomfield—City, c/o Clk., concrete paving, curbing, guttering. **$116,000.** Brown Eng. Co., K. P. Bldg., Sixth Ave. and Locust St., Des Moines, Zone 9, engrs.

Kan., Independence—City, voted **$409,000** bonds, street imprvs.

Mo., Berkeley City (St. Louis 21, P.O.)—City, Mrs. Dorothy Wilson, clk., City Hall, Airport Rd. and Helen Ave., voted **$100,000** bonds, 3 mi. concrete thoroughfare from Springdale Ave. to Airport Rd. and Highway 66, **$100,000-$170,000.** Russell & Axon, 6635 Delmar Blvd., University City, St. Louis, Zone 5, consult. engrs. CD 10/22—ENR 11/11.

Neb., Plattsmouth—City, imprv. streets. **$150,527.**

N. J., Jersey City—Bd. Freeholders Hudson Co., Courthouse, Jersey City, resurfacing Communipaw Ave. **$133,000.** CD 4/15/46—ENR 5/2/46.

O., Cincinnati—City, widening, resurfacing sect. of Clinton Springs Ave. from Washington Ave. to Vine St. **$179,600.** H. H. Kranz, City Hall, city engr. CD 11/21/44—ENR 12/14/44.

O., Norwood—City, voted bonds, Tennessee Ave. exten. west of Reading Rd. **$175,000.** J. G. Schmidt, city engr. CD 11/10.

Tex., Dallas—Texas & Pacific Ry. Co., R. J. Gammie, ch. engr. Texas and Pacific Bldg., plans by Wyatt C. Hedrick, consult. engr. and archt., 904 Fort Worth Ave., paving and drainage work, **$125,000;** grading and new railway tracks for terminal yard, **$300,000** in Industrial area on 40 acre site.

Tex., Lufkin—Angelina Co., c/o judge, Courthouse Bldg., voted bonds, 11 mi. farm-to-market roads between Hy. 69 and Ewing and 8 mi. between Hy. 69 and River. **$225,000.** Harrison & Martin, Box 91, Sudan, consult. engrs. CD 11/10.

Tex., Tyler—City voted bonds, street paving. **$150,000.** J. P. Ferrill, city engr. CD 11/20.

Wash., Spokane—City, City Hall, paving 3 mi. Garland St. Northwest Blvd. to Division St. and Empire St., Division to Market Sts., **$131,400;** 3 mi. Wellesley St. Division to Assembly Sts., **$143,695;** 1.31 mi. Thorp Rd. Inland Empire Hy. to west city limits, **$51,233;** widening pavement 1.72 mi. Trent St. Mission to Lee Sts., **$73,510;** 2.14 mi. Wellesley St., Market to Division Sts., **$73,440;** 1.67 mi. Market St., Francis to Cleveland Sts. **$101,340;** 1.89 mi. Assembly St., Francis to H Sts. **$53,690;** 2.25 mi. Second and Third Sts., Havana to Arthur Sts., **$112,480.** C. E. Davis, city engr.

●**Ont., Toronto**—Municipality, waterfront Hy. **$6,500,000;** Spadina Ave. and Spadina Rd. imprvs., **$3,000,000.** Rate payers to vote Jan. 1.

EARTHWORK, WATERWAYS

PROPOSED WORK

†**Conn., Fairfield**—U. S. Eng., 31 St. James Ave., Boston, Mass., dredging 35,000 cu. yd. in Southport Harbor, material will be pumped to Sasco Beach.

●†**Oregon**—U. S. Eng., Pittock Block, Portland, removing rock and overburden to 30 ft. below lower low water through designated areas in Coos Bay channel from Guano Rock near mile 1 to point below Empire at about Mile 4.5 disposing of excavated materials, Coos Co. **$7,000,000.**

●**Wash., Olympia** — State Capitol Com., Olympia, dam to turn southern tip of Budd Inlet into lake, known as Deschutes Basin, with road construction, etc. **$1,000,000.** Jas. W. Carey & Assoc., 1917 1 Ave., Seattle, Zone 1, consult. engrs. CD 3/30/45—ENR 4/19/45.

AIRPORTS & AIRBASES

PROPOSED WORK

●**Ill., Rockford**—AIRPORT IMPRVS.—Greater Rockford Airport Authority, K. L. Finkenstadt, chn. Bd. Comrs., Rockford, airport imprvs. incl. 3 runways, taxi strips, lighting facilities, etc., on 1040 acre tract. **$2,500,000.** CD 12/21/44—ENR 1/11/44.

Tex., Menard—AIRPORT—Menard Co., T. C. Thaxton, judge, Courthouse Bldg., administration bldg. **$45,000;** hangar, **$40,000;** taxiway, apron, runway grading, **$79,000;** runway pavng. **$48,000;** field grading and development, **$22,500;** lighting sys. and fencing, **$28,000.** Alamo City Engineers, 3005 Transit Tower, San Antonio, consult. engrs. CD 5/9/45—ENR 5/30/46.

AMERICANS ABROAD

China, Changsha—Yale University, Yale-in-China, W. Averell Harriman, chn., General Alumni Committees, New Haven, Conn., U.S.A., rebuilding brick, steel Yale-in-China College bldgs. **$400,000.**

PUBLIC BUILDINGS

PROPOSED WORK

Ark., Harrison—Boone Co., c/o Judge Aubrey Hickenbotton, Courthouse, plans by Wittenberg, Delaney & Davidson, 807 Pyramid Bldg., Little Rock, rein.-con. brick, stone, 50-bed hospital. **$300,000** bonds voted.

Ark., Van Buren—Crawford Co., J. Batchelor, clk., Court House, plans by Bassham & Wheeler, Kennedy Bldg., Fort Smith, 2 story, bsmnt., brick, concrete hospital. **$250,000** bonds voted. CD 10/29—ENR 11/13.

●**Calif., Concord**—Mount Diablo Union School Dist. Concord, voted bonds high school bldgs. **$1,000,000.** Reynolds & Chamberlain, 3833 Piedmont Ave., Oakland, archts. CD 11/12.

Calif., Menlo Park—Menlo Park School Dist., Menlo Park, $375,000 bond election Jan. 23, school, Encinal Ave. Over **$250,000.** Arthur D. Janssen, Austin Ave. and Patricia Dr., Atherton, archt.

Calif., Palo Alto—City, City Hall, plans by Birge M. Clark & Walter Stromquist, 312 Channing Ave., 2 story city hall and fire station. **$425,000** bond election Dec. 16.

●**Calif., Porterville**—State Div. Architecture, Pub. Wks. Bldg., Sacramento, plans by Anson Boyd, state archt., 1500 bed hospital for State Dpt. Mental Hygiene. **$7,500,000.**

Calif., San Mateo—Adjutant General, National Guard, 1215 16 St., Sacramento, plans by Anson Boyd, state archt., P. Wks. Bldg., Sacramento, National Guard Armory. **$250,000.**

Calif., Sunnyvale—Sunnyvale School Dist., Sunnyvale, plans by Donald Powers Smith, 583 Market St., San Francisco, 1 story, 22 classroom rein.-con. school. **$507,400.** CD 5/8—ENR 7/11.

Conn., Avon — Town, Fred Turner, chn., School Bd., Town Hall, plans by Fred Duckworth, 355 William St., Bridgeport, 2 story, bsmnt., brick, steel school. **$300,000.** CD 11/19—ENR 12/11.

Conn., Hartford—State, Fred R. Zeller, comptroller, Hartford, state compt., brick, steel state office bldg., near State Armory. Over **$250,000.** Dean Everett V. Meeks, Hartford, State Capitol, consult. archt.

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

●**Conn., Storrs**—State, F. R. Zeller, comptroller, 114 State Capital, Hartford, plans by McKim Mead & White, 101 Park Ave., New York, N. Y., 10 dormitories for University of Connecticut College campus. **$2,000,000.** CD 11/6—ENR 11/13.

Conn., Westport—Town, Bd. Educ., Harrison Lillibridge, chn. plans by Starrett & Van Vleck, 267 5 Ave., New York, N. Y. and Reginald E. Marsh, 101 Park Ave., New York, N. Y., brick, steel, Green Farms School, addn. alterations. **$500,000.**

Conn., Yaleville—Town, A. J. Prisk, chn. Bd. Educ., Yaleville, plans by C. J. Malmfeldt & Assoc., 36 Pearl St., Hartford, 2 story, bsmnt., brick, steel school. **$300,000.**

●**Fla., St. Petersburg**—City, 375-bed hospital. **$3,500,000.**

●**Ga., Macon**—Bibb Co. Bd. Educ., Courthouse, Macon, bond election Jan. 16, school imprvs. **$2,500,000.**

Ind., Jasper—Bd. Directors, Dubois Co., Memorial Hospital, Jasper, plans by Walter Scholer & Assoc., 1114 State St., Lafayette, and bids about July 1, 3 story, bsmnt., brick, stone, rein.-con. structural steel, hospital. **$600,000.**

Ind., Newport—Comrs. Vermillion Co., preliminary plans by Charles Allen, 815 S. 7 St., Terre Haute, and Wayne Weber, 408 Star Bldg., Terre Haute, assoc. archts., hospital addn. **$300,000.** CD 7/26/46—ENR 8/8/46.

Ind., South Bend—Bd. School Trustees, 1 story, brick McKinley School, 13 classrooms, gymnasium, auditorium, library and office. **$675,000.**

● **Ind., South Bend**—Bd. Comrs., St. Joseph Co., N. A. Muszer, aud., Court House, 10,000 seating capacity, brick, stone Memorial Auditorium. **$1,000,000.**

●**Ia., Fort Dodge**—Independent School Dist. of Ft. Dodge, plans by Keffer & Jones, Masonic Temple Bldg., Des Moines, 3 schools, cafeteria, Junior High School addn., Senior High School, and Junior College. **$1,000,000.** CD 4/7—ENR 4/17.

Ia., Keosauqua—City, voted **$220,000** bonds, municipal light and power plant.

Ia., Mount Pleasant—State Bd. Control, Des Moines, hospital at Mount Pleasant State Hospital. **$500,000.**

Ky., Carrollton—Bd. Directors Tri-County Memorial Hospital, J. M. Adkinson, chm., plans by Otis & Grimes, Tyler Bldg., Louisville, Memorial Hospital, serving Trimble, Carroll and Gallatin Counties. **$250,000.**

Ky., Richmond—State Engineering & Constr. Div., Frankfort, plans by C. C. and S. K. Weber, Traction Bldg., Cincinnati, O., science bldg., Eastern State Teachers College. **$400,000.** CD 2/5—ENR 2/20.

Md., Baltimore—City, 401 Municipal Bldg., plans by Henry Powell Hopkins, 10 E. Mulberry St., Out Patient Dispensary, City Hospital, 4900 Eastern Ave. **$500,000.** Van Rensselaer Saxe, 100 W. Monument St., structural engr. James Posey, 10 E. Pleasant St., mech. engr. CD 7/19/45—ENR 8/2/45.

Mich., Adrian—Bd. Educ., Adrian, plans by Taylor & Eastman, Ann Arbor, 24 classroom Lincoln School addn., 12-classroom Garfield School addn. **$250,000.**

●**Minn., Minneapolis**—Hennepin County Welfare Bd., Mrs. R. Devney, Courthouse, plans by Long & Thorshov, 400 Metropolitan Life Bldg., Minneapolis, 6 story, bsmnt., rein.-con., brick, steel county welfare bldg., 300-314 South 4 St., **$1,000,000** with equip. CD 4/11/45—ENR 4/19/45.

Miss., Batesville—Panola Co., voted **$300,000** bonds, hospital. CD 11/7.

Miss., Eupora—City plans by N. W. Owerstreet & Assocs., 201 N. Lamar St., Jackson, glove factory. **$150,000.** CD 11/19—ENR 12/11.

Miss., Greenwood — City, voted **$250,000** bonds, light plant. CD 11/19.

Mo., Ladue (St. Louis 5, P. O.)—School Dist. of Ladue, Dr. I. C. Nicholas, supt., 9060 Ladue Rd., Ladue, St. Louis, Zone 5, plans by W. B. Ittner, Inc., 408 Bd. Educ. Bldg., 911 Locust St., St. Louis, Zone 1, 2 story, ground floor, brick, rein.-con. school. **$300,000-$400,000.**

●**Neb., Omaha**—City, **$3,158,831** bond election, auditorium. **$6,698,831.** Lao A. Daly, Insurance Bldg., archt. CD 2/27—ENR 3/20.

Nev., Las Vegas—Bd. Educ. plans by A. L. Worswick, 209 S. 3 St. U shaped high school addn. **$250,000.**

N. Y., New York—New York City Housing Auth., 122 E. 42 St., Zone 17, plans by John M. Hatton, 420 Madison Ave., Zone 17., altering two 5 story tenements, one at 128 St. St. Anns Ave. and other at 130 St. Anns Ave.; 4 story tenements, 589 E. 136 St., 49 Bruckner Blvd. and 53 Bruckner Blvd. **$251,000.**

●**N. C., Kinston**—Town, voted bonds, power plant imprvs. **$1,175,000.** CD 11/12—ENR 11/27.

N. C., Washington—Town, power plant imprvs. Approx. **$700,000.**

●**N. C., Wilson**—Bd. Comrs. Wilson Co., J. T. Boyette, chn., voted bonds, schools. **$1,212,000.** CD 10/15—ENR 10/30.

N. D., Grand Forks—State Bd. Higher Educ., Bismarck, plans by Grosz & Anderson, Dakota Theater Bldg., student union bldg. at State University. **$550,000.**

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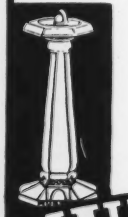

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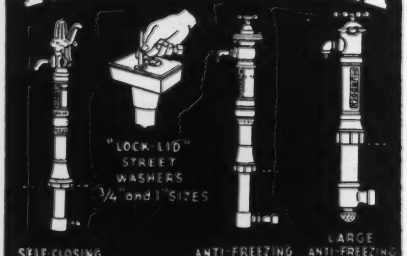
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PUBLIC BLDGS. (Proposed Work, Cont'd.)

N. D., Minot—State Bd. Higher Educ., A. F. Arnason, comr., Bismarck, plans by S. M. Houkom, 716 7 St. S. Fargo, gymnasium at State Teachers College. **$260,000.**

O., Castalia—Margaretta School Dist., Miss Mary Uhas, clk, voted bonds, school addn. **$303,000.**

O., Cleveland—Bd. Edu., J. Brown, bus. mgr., 1380 E. 6 St., plans by Arthur F. Baer, c/o owner, brick, steel, concrete school, Bellaire Rd. and W. 140 St. **$350,000.** CD 3/1/43—ENR 3/4/43.

O., Delaware—Delaware County Union School Dist., G. E. McFarland, clk., defeated bonds, high school. **$268,000.** CD 10/30.

O., Garfield Heights—Bd. Educ., defeated bonds, Maple Leaf School addn. **$350,000.** CD 11/14—ENR 11/27.

O., Ironton—Lawrence Co. Bd. Comn., voted bonds hospital addn. **$480,000.** CD 10/30.

O., Maple Heights—City Bd. Educ., voted bonds, school addn. **$550,000.** CD 10/30.

O., Massillon—Tuscarawas Twp. School Dist., L. W. Myers, clk., defeated bonds, school. **$300,000.** CD 10/30.

O., Ottawa—Putnam Co. defeated bonds, hospital addn. **$400,000.** Lyman T. Strong, 201 Colonial Bldg., Lima, archt. CD. 10/29.

O., Tipp City—Village School Dist., voted bonds school addn. **$328,000.** CD 10/30.

O., Vermilion—City Bd. Educ., voted bonds school addn. **$292,000.** CD 10/30.

O., Wapokoneta—United Local Bd. Educ., S. W. Frazier, clk., defeated bonds, school. **$290,000.** CD 10/29.

Okla., Durant—Bd. Affairs, Capitol, Oklahoma City, plans by Albert Ross, Ada, home economic bldg., at Southeastern State College. **$292,000.** CD 10/30/46—ENR 11/14/46.

Okla., El Reno—Bd. Educ., bond election Jan. 16, Central High School. **$250,000.** W. T. Vahlberg, 1517 N. Broadway, Oklahoma City, archt.

Okla., Enid—Bd. Affairs, Capitol, Oklahoma City, plans by C. L. Monott, 1915 N. Indiana St., heating plant, for Northern Oklahoma Hospital. **$275,000.**

Okla., Frederick—Bd. Educ., Frederick plans by Hudgins, Thompson & Ball, 100 W. Main St., Oklahoma City, high school. **$350,000.**

●**Okla., Norman**—Bd. Affairs, Capitol, Oklahoma City, plans by Hudgins, Thompson & Ball, 110 W. Main St., Oklahoma City, general ward bldg., **$277,500;** plans by W. T. Vahlberg, 1517 N. Broadway, Oklahoma City, tuberculosis ward, **$337,500;** plans by Berry & Hicks, Tradesmens Bldg., Oklahoma City, kitchen and dining hall, **$525,000,** all at Central State Hospital. CD 1/31/45—ENR 2/22/45.

Okla., Pauls Valley—Bd. Affairs, Capitol, Oklahoma City, plans by Harold Flood, Ardmore, dormitory for Pauls Valley State Hospital. **$300,000.**

Pa., Jeannette—Jeannette Dist. Hospital, Jeannette, plans by Sorber & Hoone, 1st. Natl. Bank Bldg., Greensburg, hospital. **$750,000.** CD 2/19—ENR 3/3.

●**Pa., Phila.**—Dpt. Property & Supplies, 18 and Herr Sts., Harrisburg, power plant at Phila. (Byberry) State Hospital. **$2,052,000.** A. F. Jones, c/o owner, ch. engr.

Pa., Pittsburgh—Dpt. Property & Supplies, 18 and Herr Sts., Harrisburg, replacement and renewal plumbing, heating, lighting and water services at Western State Penitentiary, incl. drilling addnl. water well. **$558,000.** A. F. Jones, c/o owner, ch. engr.

†**R. I., Newport**—Construction Officer, P. Wks. Dpt., Naval Training Station, Newport, power plant reconstruction and repairs, Naval Training Station. **$240,000.** Capt. A. J. Fay, Naval Air Base, Newport, owners engr.

S. C., Charleston—The Citadel, Hampton Park, Charleston, hospital addn., 16-unit apartment for faculty and 64 classroom bldg. **$500,000.**

S. C., Orangeburg—State A. & M. College, Orangeburg, law bldg. **$375,000.**

●**Tenn., Chattanooga**—City School Bd., Kirkman Vocational School Addn. **$600,000;** Howard High School **$700,000;** West Main St. School **$300,000;** Chattanooga High School addn. **$225,000.**

●†**Tenn., Oak Ridge**—City Management Div. Atomic Energy Comn., Oak Ridge, plans by Skidmore, Owningş & Merrill, 100 W. Monroe Street, Chicago, Ill., 500 permanent housing units, 100 acre site, Oak Ridge Turnpike near Illinois Ave. **$5,000,000.**

Tenn., Oak Ridge—State, c/o Jim McCord, gov., Nashville, cancer hospital and research institution. Over **$3,000,000.**

●†**Tenn., Oak Ridge**—U. S. Atomic Energy Comn., Box 456, nuclear furnace. **$1,000,000-$3,000,000.**

Tenn., Winchester—Franklin Co. Bd. Educ., voted bonds, high school and repairing other schools. **$750,000.** CD 11/26.

Tex., Fort Stockton—Fort Stockton Public Schools, c/o E. W. Smith, supt., voted bonds, gymnasium, cafeteria and school bldg. addn. **$375,000.** Harvey P. Smith, Natl. Bank Commerce Bldg., San Antonio, archt.

●**Tex., Lubbock**—City, voted bonds, electric light and power plant. **$2,000,000.** Homer A. Hunter, engr. CD 11/10.

Tex., Midland—City, R. H. Gifford, mayor, voted bonds, municipal bldg. **$275,000.**

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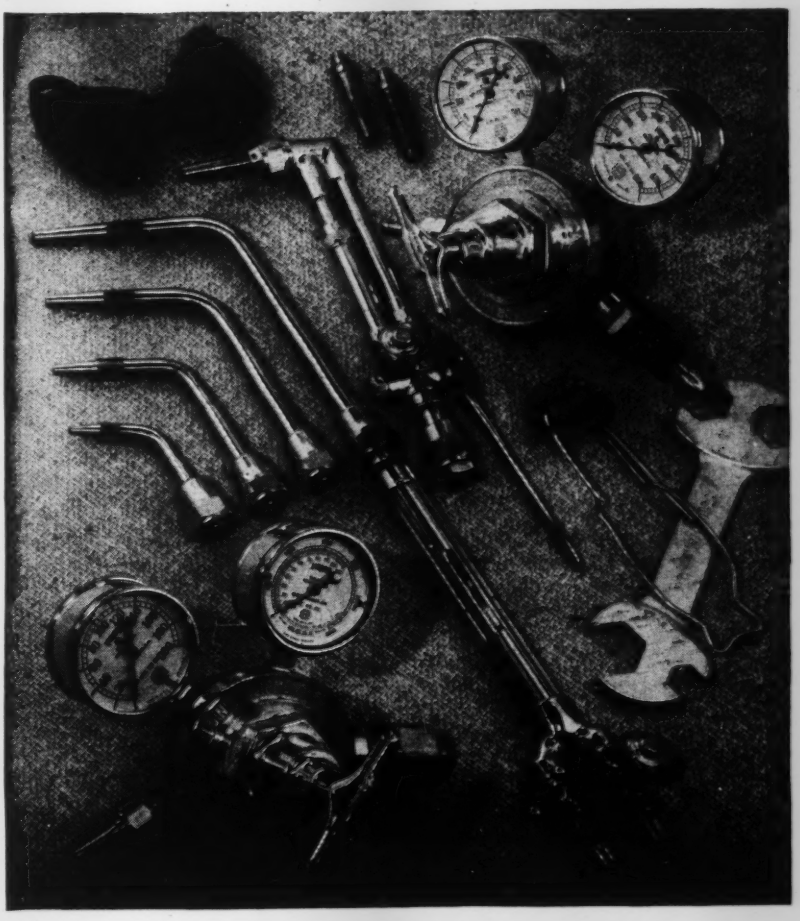

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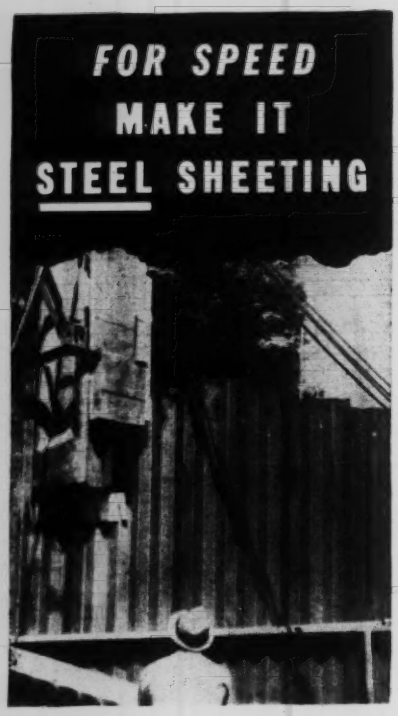

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

●**Tex., Pasadena** — Pasadena Independent School Dist., voted bonds, school, **$650,000**; school expans. and addns., **$600,000**; library, cafeteria, kitchen, teachers rooms bldgs. **$350,000**. CD 11/26.

Wash., Bellingham—Western Wash. College of Educ., Bellingham, plans by Bebb & Jones, Hoge Bldg., Seattle, Zone 4, music bldg. **$950,000.**

Wash., Opportunity—Central Valley School Dist., voted special levy, 1 and 2 story frame, masonry Junior High School. **$500,000.** W. Mallis, Lyon Bldg., 3 and James Sts., Seattle, Zone 4, archt. CD 11/7.

Wis., Milwaukee—Housing Auth. of Milwaukee, housing about 300 units, N. 20 and N. 23 Sts., W. Villard and W. Fairmount Aves.; 372 units, S. 22 and S. 25 Sts., W. Ohio and W. Morgan Aves.

●**Wis., Oshkosh**—Winnebago Co., plans by Auler, Irion & Wertsch, consult. engrs. and archts., E. R. A. Bldg., county hospital. **$1,000,000.**

†**Alaska**—Alaska Native Service, Dpt. Interior, Goldstein Bldg., Juneau, living quarters for nurses and doctors, Point Barrow, **$40,000**; nurses quarters, Bethel, **$70,000**; school at Savoonga, **$40,000**; schools at Elim, Napaskiak and Holikachuk **$30,000** each, at Yakutat, **$27,000**; teachers quarters, Unakleet, **$20,000**; duplex residence, Wrangell, **$25,000.**

Alta., Lethbridge—Central Mortgage & Housing Corp., 4 Temporary Bldg., Ottawa, Ont., 100 addnl. housing units. Approx. **$550,000.**

B. C., Vancouver—Pacific National Exhibition Assn., Exhibition Park, Vancouver, rein.-con. agricultural bldg. **$440,000.**

Man., Morris — Morris Hospital Dist. 25, Morris, hospital and 4 medical nursing units. Approx. **$250,000.**

N. S., Pictou—Dpt. Educ., 2 Brunswick St., Halifax, consolidated high school for East Pictou area. Approx. **$275,000.**

Ont., Alexandria—Sacred Heart Separate School Bd., Alexandria, school, Main St. Approx. **$275,000.**

Ont., Eastview — High School Bd., J. P. Brown, chn., Eastview, high school, incl. 4 classrooms, library, art, music, home economics, chemistry, physics, typing and manual training rooms, combined gymnasium and auditorium, kitchen, health office, etc. **$475,000.**

Ont., North Bay—North Bay Hospital Comn., Mrs. J. Smorthwaite, secy., 620 Cassells St., revised plans by O'Gorman & Woolfson, 209 Mackay Bldg., Sudbury, hospital on another site instead of exten. present Queen Victoria Hospital. Approx. **$350,000.** Thomas & Wardell, 2253A Bloor St. W., Toronto, engrs. CD 8/22/46—ENR 9/5/46.

Ont., Simcoe—Bd. Educ., D. G. Campbell, Chn., Simcoe, high school addn. **$350,000.**

Ont., Sudbury—Bd. Educ., Sudbury, school. Approx. **$250,000.** Rate payers approved funds.

Ont., Toronto—Toronto Western Hospital, 391 Bathurst St., A. J. Swanson, supt., plans by Govan, Ferguson & Lindsay, 515 Jarvis St., 200-bed, brick, steel hospital addn., Bathurst St. north of Dundas St. Approx. **$800,000.**

Ont., Toronto—York Twp., Toronto, municipal bldg. **$600,000.** Ratepayers to vote Jan. 1. O. M. Falls, 40 Jarvis St., engr.

●**Ont., Windsor**—Central Mortgage & Housing Corp., 159 Bay St., Toronto, 500 homes. Approx. **$2,225,000.**

Que., Jonquiere—School Comn., A. Laberge, secy., plans by Lamontagne & Gravel, 187 Racine St., Chicoutinmi, rebuilding school. About **$350,000-$400,000.**

Que., Lachute—Local Bd. & Dpt. Educ., Quebec City, school. **$250,000.**

Ont., Listowel—High School District Bd., W. G. E. Spencer, secy. plans by S. B. Coon & Son, 4 St. Thomas St., Toronto, high school. About **$380,000.** CD 10/17—ENR 10/30.

Que., Montreal—Montreal Protestant Central School Bd., 3460 McTavish St., 2 schools, 1 in Darlington Zone and other in Victoria-VanHorne Zone. **$600,000.**

Que., Outremont (Postal Dist. Montreal)—Montreal Protestant Central School Bd., 3460 McTavish St., Montreal, school, Stuart Ave. Over **$350,000.**

Que., St. Simon de Drummond—School Comn., H. Ratte, secy., plans by L. N. Audet, 52 Prospect St., Sherbrooke, 2 story, bsmnt., concrete, brick, school and teachers residence. Approx. **$260,000.**

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Beverly Hills — Beverly Oakhurst Bldg. Corp., Beverly Hills, plans by Monroe R. Sandel, 6715 Hollywood Blvd., Los Angeles, 2 story, 39 unit frame, stucco apartment, rein.-con. bsmnt. garage. Over **$250,000.**

●**Calif., San Francisco** — Western Jewelry Market, Inc., c/o J. L. Stewart, archt., 206 Sansome St., San Francisco, 9 story, 137½x275 ft., glass and cement block office. **$...000,000.**

Ind., Evansville — Bradford Homes, Inc., Weinbach Ave., eighty-two 1½ story, 4 and 5 room frame brick residences, Southwood Terrace, streets, curbing, walks, sewers. **$750,000.**

N. C., Charlotte—Scotland Homes, Inc., W. Marshall Moore, pres., 2828 S. Boulevard, 96 family unit 1 story brick veneer apartments on 16 acre tract between Poplar Gables and Myers Park. Approx. **$800,000.**

Pa., Erie—First Presbyterian Church, 11 W. 5 St., plans by Myers & Krider, 407 Commerce Bldg., 1 story, bsmnt., brick, concrete-block, steel sanctuary and educational bldg., remodeling educational bldg., Peach and 5 Sts. **$300,000.** CD 4/21/44—ENR 5/4/44.

●**Tex., Houston**—Highland Village Corp., c/o S. N. Adams, 3713 Inwood St., plans by Pierce & Cowell, 4605 Montrose Blvd., 100 dwellings between Westheimer and W. Alabama Sts., **$2,000,000**; shopping center, Westheimer Rd., **$600,000.** Howe & Wise, Stewart Bldg., consult. engrs.

Tex., Houston — B. F. Sturman, Sterling Bldg., 67 residences and 8 multi-family units 2nd Sect., Sturman Park. **$700,000.**

INDUSTRIAL BUILDINGS

PROPOSED WORK

Ga., Cochran—GRAIN ELEVATOR—Owner, c/o W. H. Griffin, Cochran, grain elevator. Over **$100,000.**

Ky., Louisville — WAREHOUSE — Struck Constr. Co., 147 N. Clay St., reconstructing warehouse. Approx. **$100,000.**

Neb., Lincoln—WAREHOUSE, etc.—Watson Bros. Transportation Co., 802 S. 4 St., Omaha, warehouse and terminal, 1200 N. 16 St. **$125,000.**

Tex., Houston—BOTTLING PLANT—Canada Dry Ginger Ale, Inc., 3115 Polk St., plans by Irving R. Klein & Assoc., Bankers Mortgage Bldg., rein.-con. bottling plant, beam and pier fdn., air-conditioning. **$175,000.**

N. W. T., Yellowknife—MILL—Discovery Yellowknife Gold Mines Ltd., Yellowknife, 150 ton mill, etc. **$125,000.** CD 11/19—ENR 12/11.

Ont., Humberstone — MILL — Ogilvie Flour Mills Co. Ltd., Sun Life Bldg., Montreal, Que., flour mill, marine tower, workhouse, storage quarters, warehouse, boiler house, grain elevator, east side of Welland Canal, here at Ramey's Bend. Approx. **$900,000.** C. D. Howe, 36 James St. S., Hamilton, engr. CD 5/22—ENR 6/12.

Que., Cap de la Madeleine — PLANT — DeLuxe Furniture Mfg. Co. Ltd., 157 Pierre St., plant. Approx. **$150,000.**

●**Que., Havre St. Pierre**—PLANT—Kennecott Copper Corp., c/o Hon. M. Duplessis, Quebec City, smelting plant, 30 mi. from here, Quebec North Shore. Over **$2,000,000.**

UNCLASSIFIED

PROPOSED WORK

Ala., Graysville—NATURAL GAS SYS.—City, Graysville, natural gas sys. **$300,000.** J. W. Goodwin Eng. Co., 729 S. 29 St., Birmingham, consult engr.

● **Calif., Vallejo**—WATERFRONT PARK, etc.—City, City Hall, waterfront park and small boat harbor. **$1,800,000.** T. D. Kilkenny, City Hall, city engr.

Conn., Westport—BEACH IMPROVEMENTS—Town, Westport Beach Comn., Town Hall, plans by Frederick P. Stabell, 5 Railroad St., South Norwalk, beach imprvs., incl. dredging basin and channel, rebuilding breakwaters, resanding South and Compo Beaches. **$100,000.** Bond issue authorized. CD 9/10—ENR 10/2.

Fla., Fernandina—CAUSEWAY—Fernandina Port Authority, Fernandina, steel, concrete bridge causeway and approaches with steel lift, navigational sect. 60 ft. wide, across Nassau Sound, connecting privately owned New Scenic Hy. between Fernandina and Jacksonville along the ocean front. Approx. **$150,000.** E. C. DeGarmo, Tallahassee, state hy. engr.

Ga., Augusta—STADIUM—Augusta Baseball Club, c/o Troy Agnew, pres., Augusta, stadium. **$100,000.**

Ga., Columbus—STADIUM—City plans by Joseph H. Croxton, Columbus, memorial stadium addn. **$250,000.**

Ill., Chester—HARBOR and DOCK—City, pleasure craft harbor and 300 ft. commercial dock in the Mississippi River. **$100,000-$150,000.**

Md., Baltimore — RECREATION CENTRE and PLAYGROUND—City, Bd. Recreation & Parks, Druid Hill Park, Zone 17, recreation centre, **$125,000**; playground, **$60,000**, Curtis Bay area. Herman F. Lucke, Druid Hill Park, Baltimore, Zone 17, engr. CD 2/7/45—ENR 3/8/45.

●**Md., Baltimore**—STADIUM—City, 401 Municipal Bldg., 60,000 seating capacity, steel, rein.-con. stadium, 33 St. **$2,400,000.** Faisant & Kooken, 347 N. Charles St., designing engrs. CD 1/27/44—ENR 2/10/44.

Md., Baltimore—RECREATION CENTERS, etc.—City Bd. Recreation & Parks, Engineering Office, Druid Hill Park, Baltimore, 1 story, masonry, recreation center, Columbia Ave. **$55,000**; 1 story, masonry recreation center and playing field, incl. grading, fencing, play-

UNCLASSIFIED (Proposed Work, Cont'd.)

ground equip., Bentalou Park-Baltimore Center. **$75,000;** 1 story, masonry recreation center, playground and playfield on City Hospital site, Eastern Ave., incl. grading, fencing, playground equip., **$85,000.** Herman F. Lucke, c/o owner, engr. in charge.

Mo., Ferguson (St. Louis 21 P.O.)—SWIMMING POOL, etc.—City, City Hall, 16 Church Rd., voted **$155,000** bonds, purchasing, Wabash Club Grounds, Wabash and January Aves., installing rein.-con. swimming pool, and park imprvs. CD 10/22—ENR 11/11.

Mo., Jefferson City—SWIMMING POOLS—City, H. W. Els, clk., City Hall, voted $210,000 bonds, rein.-con. swimming pool in Memorial Park, **$150,000,** and rein.-con. swimming pool at Community Center, **$60,000.** R. W. Fowler, City Hall, city engr. CD 11/12.

N. C., Kinston—STADIUM—Town, Guy Elliott, mayor, voted **$150,000** bonds, municipal stadium at Grainger Park.

North Dakota — RURAL DISTRIBUTION LINES — Tri-County Electric Co-operative, Carrington, completing previously approved construction and 275½ mi. rural distr. line, Foster Co. **$455,000.**

O., Cleveland—TUNNEL—City, City Hall, and Erie R. R., I. H. Schram, ch. engr., Midland Bldg., vehicular tunnel under Erie R. R. tracks at E. 79 St., incl. closing off underpass at E. 74 St. (to be replaced by underpass at E. 79 St.) and exten. E. 79 St. to north end of Fleet Ave. **$350,000.**

O., Massillon—PARK—City, defeated bonds, park and recreational imprs. **$175,000.** C. E. Rice, city engr. CD 10/31.

Oklahoma—RURAL DISTRIBUTION LINES—Cimarron Electric Co-operative, Kingfisher, sys. imprvs. for completed construction with prior REA approval, completing previously approved construction and 258 mi. rural distr. lines, Kingfisher Co. **$520,000.**

Oklahoma—RURAL DISTRIBUTION LINES—Kay Electric Co-operative, Blackwell, 177 mi. rural distr. lines and completing previously approved construction, Kay Co. **$352,000.** CD 1/10/46—ENR 1/24/46.

Okla., Chickasha — STADIUM — City, voted bonds, athletic stadium. **$125,000.** Pate Eng. Co., Daniels Bldg., Tulsa, consult. engr. Sam Griffin, city engr.

S. C., Myrtle Beach—GOLF COURSE—The Dunes & Beach Club, Myrtle Beach, 18 hole golf course. **$200,000.**

Tennessee—RURAL DISTRIBUTION LINES—Pickwick Electric Membership Corp., Selmer, sys. imprvs., completing previously approved construction and 120 mi. rural distr. lines, McNairy Co. **$365,000.**

Tenn., Nashville—SPORTS ARENA—City, c/o Thomas L Cummins, mayor, sports arena. **$500,000.**

Texas—RURAL DISTRIBUTION LINES—Comanche County Electric Co-operative Assn., Comanche, addnl. rural distr. lines. Comanche Co. **$340,000.**

Texas—RURAL DISTRIBUTION LINES—Cooke County Electric Co-operative Assn., Muenster, addnl. rural distr. lines, Cooke Co. **$300,000.**

Texas — RURAL DISTRIBUTION LINES — Decatur Electric Co-operative, Decatur, 133 mi. rural distr. lines, Wise, Denton, Clay, Montague, Jack and Parkes Counties. **$250,000.**

Texas—RURAL DISTRIBUTION LINES—Tri-County Electric Co-operative, A. W. Mills, Mgr., Azle, 185 mi. rural distr. lines, Tarrant Co. **$185,000.** Freese & Nichols, 407 Danciger Bldg., Fort Worth, consult. engrs.

Texas—CRUDE OIL PIPELINE—Western Refineries Corp., Pecos, 30 mi. crude oil main pipeline from Munstill field to Orla, and erecting loading racks at Orla, **$100,000;** crude oil pipeline gathering sys. in Tunstill field northwest of Pecos. **$70,000.**

Tex., Pelly—SWIMMING POOL—Town of Pelly (Tri-Cities) E. D. Cleveland, mayor, 40x125 ft. fan shaped swimming pool and 15x35 ft. wading pool, rein.-con. **$130,000.** Paddock Eng. Co. of Texas, 900 S. Ervay St., Dallas, consult. engr. CD 11/19—ENR 12/4.

Washington — RURAL DISTRIBUTION LINES—Public Utility Dist. 1 of Okanogan Co., Okanogan, 219 mi. rural distr. lines, Okanogan Co. **$400,000.**

●**Wash., Seattle**—LIGHTING SYSTEM—City, County, City Bldg., 3 and James Sts., Zone 4, bond election Mar. 2, imprv., exten. street lighting sys. **$3,500,000.** C. L. Wartelle, city engr.

Wisconsin—RURAL DISTRIBUTION LINES—Rock County Electric Co-operative Assn., Janesville, sys. imprvs. and 57 mi. rural distr. lines, Rock Co. **$145,000.**

Wyoming—RURAL DISTRIBUTION LINES—Riverton Valley Electric Assn., Riverton, sys. imprvs. and 99 mi. rural distr. lines, Freemont Co. **$167,000.**

Virgin Islands — RURAL DISTRIBUTION LINES—Virgin Islands Co. of Christiansted, St. Croix, purchase, install 234 kw. generating unit, sys. imprvs. for completed construction and 29½ mi. rural distr. lines, St. Croix Co. **$157,000.**

●**Alberta and Manitoba**—GAS PIPELINE—Dpt. Lands & Mines, Edmonton, gas pipeline from vicinity of Calgary, Alta. to Winnipeg, Man. area, with lateral lines to Regina, Brandon, and Moose Jaw. Approx. **$45,000,000.**

N. S. Cornwallis—SUMMER RESORT—William E. Butlin, c/o Ministry of Industry, Halifax, converting Wartime Naval Training Station on shore of Annapolis Basin to summer tourist resort. **$150,000.**

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The FS-7A ELECTRIC (READY FOR IMMEDIATE DELIVERY)

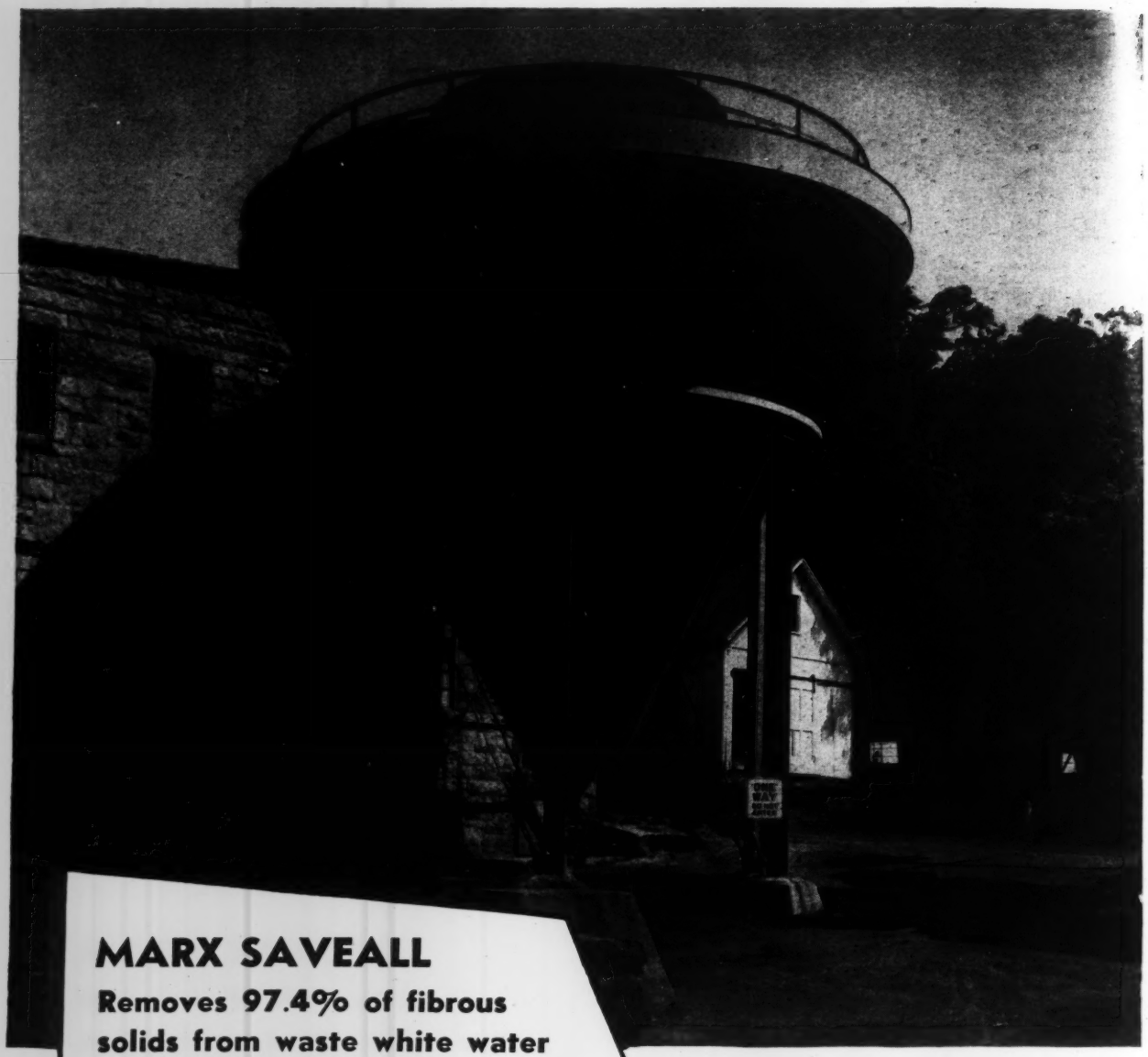
Ideal on many types of construction. Built around the lightest, yet most powerful motor we have ever used on equipment of this character. Easy to handle or skid. Takes any of our standard heads up to 2⅜" x 18½" with flexible shafting in 24" to 14' lengths. Delivers up to 10,000 V.P.M. on AC or DC 110-120 Volt. Does many jobs formerly done only with larger machines.

Left: The FS-7A with reduction attachment to provide the most desirable shaft speed for wet or dry rubbing or grinding of concrete.

JACKSON

JACKSON INTERNAL—EXTERNAL ELECTRIC-FLEXIBLE SHAFT-HYDRAULIC Concrete VIBRATORS

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN



MARX SAVEALL

Removes 97.4% of fibrous solids from waste white water

The Saveall shown above was recently erected at a paper boxboard mill to clarify the white water effluent prior to its re-use or discharge into a nearby stream. A recent report shows that this Saveall reduces suspended fibrous solids in the waste water from 4.66 lbs. per 1,000 gals. to 0.10 lbs., a removal of 97.4 per cent.

The clarification process in a Marx Saveall is accomplished by settling. There are two large steel plate cones, one mounted inside the other. The inner cone has a large opening at the bottom. There is also a small cone-shaped receiving well at the top and an inverted de-aeration cone directly under the receiving well. Waste white water from the paperboard machines is fed into the receiving well at the top and overflows onto the deaeration cone and over its outer edge into the center of the filter. The suspended solids settle through the bottom of the inside cone, collect in the bottom of the outside cone and are drawn off and fed into a continuous beater for re-use. The water, minus most of the solids, rises between the two cones and overflows into a weir at the top of the outer cone. From there it is piped to storage tanks for re-use in the beater room or it is discharged into the stream.

Marx Savealls are typical of the special steel plate structures we build. Let our engineers work with you on your next job that requires steel plate work.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4 ..... 2101 McCormick Bldg.
New York 6 ..... 3311-165 Broadway Bldg.
Cleveland 15 ..... 2201 Guildhall Bldg.
Detroit 26 ..... 1506 Lafayette Bldg.
Philadelphia 3 ..... 1623-1700 Walnut Street Bldg.
Tulsa 3 ..... 1617 Hunt Bldg.
Birmingham 1 ..... 1520 North Fiftieth St.
Atlanta 3 ..... 2125 Healey Bldg.
Havana ..... 402 Abreu Bldg.
Houston 2 ..... 2109 National Standard Bldg.
Los Angeles 14 ..... 1411 Wm. Fox Bldg.
San Francisco 11 ..... 1220-22 Battery Street Bldg.

Plants in BIRMINGHAM CHICAGO, and GREENVILLE, PENNA.

In Canada—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

CONSTRUCTION REPORTS

Bids Asked—Low Bidders—Contracts Awarded

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York 18, N. Y.

ELSIE EAVES, Manager *J. A. MAHONEY, Reports* *E. R. BIGGERSTAFF, M. R. ROESSLER, Statistics*

WATER SUPPLY

BIDS ASKED

Bids Asked January 6

Mo., Charleston—City, R. R. Davis, mayor and T. A. Zillafro, clk., exten. imprv. water supply and sanitary sewerage sys., incl., 3.28 mi. sanitary sewage collection mains, 5.25 mi. water mains, 2.4 mi. sewage force mains, modification, reconditioning, installing equip. in 4 sewage pumping of lift stations, constructing station, sewage disposal plant, and water treatment plant. $300,000. Plans deposit $15. Extended date L. T. Berthe, c/o owner, engr. Horner & Shifrin, 803 Shell Bldg., 1221 Locust St., St. Louis, Zone 3, consult. engrs. CD 11/20—ENR 11/27.

N. C., Newton—Town, J. M. Abernath, mayor, WW imprvs. Harwood Beebe Co., Spartanburg, engr. CD 12/8—ENR 12/11.

Bids Asked January 7

Ore., Gearhart—City, City Hall, installing 13,000 ft. pipe to connect water supply with that of Warrenton. Plans deposit $10. Tim de Jong, city engr.

Bids Asked January 9

D. C., Wash.—Dist. Comrs., District Bldg., 891 lin. ft. 30 in. and 7,839 lin. ft. 20 in. watermains from 4 and B Sts. N.E. to Potomac and Kentucky Aves. S.E.

Bids Asked January 15

Tex., McCamey—City, C. C. Bone, mayor, WW extens., imprvs., incl. 23,000 lin. ft. 10 in. asbestos cement pipe, brick, concrete pump house; installing 2 pump units, etc. $70,000. Plans deposit $5. Ashley G. Classen & Assoc., 412 Martin Bldg., El Paso, engrs. CD 9/29—ENR 10/2.

Bids Asked January 20

Pa., Coraopolis—E. N. Weaver, secy., Coraopolis Boro, WW imprvs. Plans deposit $15. Chester Engineers, 210 East Park Way, North Side, Pittsburgh, Zone 12, engrs.

Bids Asked February 16

N. D., Pembina—City, mains, elevated tank, water treatment plant addn. $30,000, Lium & Burdick, 15 N. 5 St., Grand Forks, engrs.

LOW BIDDERS

Calif., Arbuckle—Arbuckle Pub. Utility Dist., Dec. 11, water sys., using **(A)** c.i. pipe, **(B)** asbesfos cement, pipe **(C)** lined steel pipe, from R. J. Brant, 118 New Montgomery St., San Francisco, **(A) $69,587;** from E. T. Haas Co., Box 411, San Mateo, **(B) $58,853, (C) $61,827.** CD 11/21—ENR 11/27.

CONTRACTS AWARDED

Md., Frederick—Mayor and Alderman of Frederick, City Hall, Linganore Filtration Plant addns., alterations, to Allied Contractors, 10 E. Pleasant St., Baltimore. **$73,954.** Awarded 12/10. Whitman, Requardt & Assoc., 1304 St. Paul St., Baltimore, engrs.

Mo., Kennett—City, J. W. Karsten, mayor, WW imprvs., drilling well, pump and motor, to Weldon Well Co., Cape Girardeau, **$42,600;** 250,000 gal. steel tank on tower, to Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago, Ill., **$44,900.** Bids 12/4. CD 11/18—ENR 11/20.

Okla., Oklahoma City—City, watermain from elevated storage tanks to distr. sys., to B & M Constr. Corp., Petroleum Bldg. **$134,839.** Est. $140,145. Bids 12/16. CD 12/8.

Ont., Goderich — Goderich Pub. Utilities Comn., J. B. Kelly, mgr., 200,000 imperial gal. elevated steel tank for water sys., to Horton Steel Works Ltd., 40 Jennet St., Fort Erie. Approx. **$47,000.** Bids 11/12. CD 11/3—ENR 11/6.

SEWERS, WASTE DISPOSAL

BIDS ASKED

Bids Asked December 29

N. Y., Brooklyn—President Brooklyn Boro, Boro Hall, Zone 2, combined sewers in Flushing, Park and in intersection of Myrtle and Nostrand Aves.

Bids Asked January 6

Mo., University City (St. Louis 5, P. O.)—City, A. J. Shopp, clk., City Hall, 6801 Delmar Blvd., storm water and sanitary sewers, manholes, junctions, catch basins, etc., Sewer Dist. 89, Proj. 298. **$135,378.** Plans deposit $10. W. Heimbuecher, City Hall, 6801 Delmar Blvd., city engr.

Bids Asked January 12

N. D., Rugby—City, sewage plant. $55,000. Douglas Karhoff, city engr.

Bids Asked January 19

Mich., Port Huron—City, at office A. R. Hill, clk., City Hall, Contr. 1, 25,020 lin. ft. 8- to 42-in. intercepting sewers, 18,665 lin. ft. 40- to 54-in. sewer in tunnel, manholes, shafts, diversion chambers, river crossing and appurtenant structures, plans deposit $15. A. R. Hill, city clk., City Hall, sewage and garbage treatment plant, etc., plans deposit $25. Shoecraft, Drury & McNamee, State Savings Bank, Ann Arbor, consult. engrs.; adv. ENR 12/25. CD 11/21/44—ENR 12/14/44.

LOW BIDDERS

Calif., Modesto—City, City Hall, Dec. 10, laying 60 in. concrete pipe industrial waste sewer line, from Ivor W. Swanson, 2452 E. Poplar St., Stockton. **$50,945.** CD 12/20/46—ENR 1/9/47.

Mass., Boston—City, R. P. Curley, comr. P. Wks., City Hall Annex, project abandoned, brick, concrete incinerator, Western Ave. **$200,000.** CD 6/25—ENR 7/3.

†Oregon—U. S. Eng., Pittock Block, Portland, sanitary sewerage sys., sewage treatment plant, water supply and distr. sys. and exten. electrical distr. sys. for Lookout Point Dam housing, Lane Co., Inv. No. 35-026-48-377, from Werner & Jeske, 492 Park St., Eugene. **$117,294.** Est. $126,928. CD 12/1.

S. C., Bishopville—Town, rejected bids Dec. 11, sewage treatment plant and sewage pump. station. L.B. **$89,284.** CD 12/2—ENR 12/4.

CONTRACTS AWARDED

Calif., Walnut Creek—Central Contra Costa Sanitary Dist., 1335 Commercial Lane,, main trunk sewer, Sect. 3, to Stolte, Inc., 8451 San Leandro St., Oakland. **$173,337.** Bids 12/11. CD 11/26.

Wis., St. Croix Falls—Village, relay and sanitary sewer extens., to Lametti & Lametti, 615 Drake St., St. Paul, Minn. **$50,000** pumping station, force account. Bids 12/3. CD 11/19—ENR 11/27.

BRIDGES

BIDS ASKED

Bids Asked December 30

Maryland—State Rds. Comn., Baltimore, 3 span, 41 - 51 - 41 ft., steel beam concrete bridge, 28 ft. wide, carrying hy. connecting Edmonson Ave. extended and Columbia Pike, over Frederick Rd. (U. S. Rte. 40), approx. 1 mi. west of Ellicott City, Howard Co. Plans deposit $5.

Bids Asked December 30

New Jersey—State Hy. Dpt., Trenton, bridge and approaches at Baird Blvd. on Route 25 Entrance Road, Sects. 2E and 3E; bridge and approaches near Haddon Ave. and widening from Cooper River to Dwight Ave., Route 45, Sect. 23, city of Camden, Collingswood and Woodlynne Boro, Camden Co. 2.525 mi. Plans deposit $10. Extended date.

Bids Asked January 16

Texas—State Hy. Comn., John S. Redditt, chn., Ausin, fabrication and delivery structural steel for Colorado River Bridge, Hy. 71, Proj. C. 266-2-17, Colorado Co. **$127,000.** D. C. Greer, Austin, engr.

LOW BIDDERS

Ill., East St. Louis—East Side Levee & Sanitary Dist., Bd. Trustees, 628 A Missouri Ave., Dec. 5, Proj. 14-A, rein.-con. culvert under tracks of Baltimore & Ohio R.R., incl. rein.-con., U-shaped channel between new culvert and existing culvert under tracks of Pennsylvania R.R., from Moore Brothers, Inc., 2000 St. Clair Ave. **$77,289.** CD 10/29—ENR 11/6.

Louisiana—State Dpt. Hys., Baton Rouge, Dec. 5, bridges, etc., Lafourche Parish, from W. R. Aldrich & Co., P.O. Box 1751, Baton Rouge, **$84,719;** Caddo Parish, from Flenniken Constr. Co., P.O. Box 634, Shreveport, **$64,060.** CD 11/21—ENR 11/27.

Louisiana—State Hy. Dpt., Baton Rouge, Dec. 10, Bayou Lafourche Bridge, Proj. SP 829-18-01, Lafourche Parish, from W. R. Aldrich & Co., Kalurah University Gardens, Baton Rouge. **$84,719.** CD 11/12—ENR 11/20.

La., New Iberia—Police Jury Iberia Parish, New Iberia, Dec. 11, 2 bridges over Bayou Teche at Bayside and Belle Place, from Austin Bridge Co., 2308 Amelia St., Dallas, Tex. **$111,000.** CD 11/28—ENR 12/4.

Montana—State Hy. Comn., Helena, rejected bids Dec. 10, Central Park Bridge, **$118,000;** bridge over Madison River, **$90,000,** both Gallatin Co.; 2 bridges over Beaverhead River, Madison Co., **$125,000.**

North Carolina—State Hy. Dpt. & P. Wks. Comn., Raleigh, Dec. 16, structures 0.36 mi. Cumberland Co., from Zeigler-Cline Constr. Co., Box 386, Fayetteville, **$55,875** est. $50,000-$75,000***7.12 mi. Burke Co., from Wilson Constr. Co., Box 603 Salisbury, **$66,212** est. $50,000-$75,000***5.91 mi. Anson Co., from Bowers Constr. Co., Box 1706, Raleigh, **$75,594** est. $75,000-$100,000***bridge over Broad River, Rutherford and Polk Counties from E. W. Grannis Co., Box 231, Fayetteville, **$82,568** est. $50,000-$75,000. CD 12/5—ENR 12/11.

CONTRACTS AWARDED

Montana—State Hy. Comn., Helena, bridges, Jefferson Co., to Hansen & Parr, W. 232 Pacific St., Spokane, Wash., **$123,410*****Missoula Co., to Cahill-Mooney Constr. Co., 220 E. Front St., Butte, **$57,966,** est. $50,000***Fergus Co., to Dudley Constr. Co., Great Northern Yards, Great Falls, **$54,705,** est. $50,000***Custer Co., to W. Mackin, 1145 N. 30 St., Billings, **$61,652,** est. $63,000***Prairie Co., to W. P. Roscoe Co., Box 633, Billings, **$144,760,** est. $134,000***Valley Co., to L. V. Lockwood, Glasgow, **$109,730,** est. $115,000. Grand total $552,223. Bids 12/10. CD 11/3—ENR 11/13.

South Dakota—State Hy. Comn., Pierre, 286 ft. I-beam viaduct and 53 ft. rein.-con. viaduct, Butte Co., to Northwestern Eng. Co., Rapid City. **$85,649.** CD 12/2. Bids 12/9.

PROJECTS COVERED

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks $22,500; other public works $40,000; industrial buildings $55,000; other buildings $205,000.

Classes of Construction

(Name in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges
Streets & Roads
Earthwork, Waterways
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings

Unclassified

Stages Reported

PROPOSED WORK: Including appointment of engineers or architects.

BIDS ASKED (new announcements only). For full calendar, see also preceding issues of ENR.;

LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Symbols and Abbreviations Include:

† Federal Government
● Project of $1,000,000 or over.
ENR Engineering News-Record
CD Engineering News-Record Construction Daily

STREETS AND ROADS

BIDS ASKED

Bids Asked December 29

N. Y., Brooklyn—President Brooklyn Boro, Boro Hall, Zone 2, curb sidewalk and wall enclosure on Flatlands Ave. (south side) between E. 76 St. and Ralph Ave. for Flatlands Ave. Corp. Yard. CD 11/17—ENR 11/20.

Bids Asked January 12

Ia., Exira—City, R. H. Hansen, clk., street imprvs., incl. 24,081 lin. ft. curb and gutter, 1,000 cu. yd. fine and 14,580 cu. yd. rough grading, 845 lin. ft. corrugated culvert pipe. Plans deposit $10. Rowat-Murray, Estherville and Belmond, engrs.

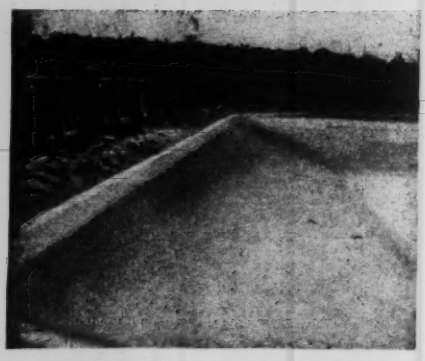
Bids Asked January 16

●Texas—State Hy. Comn., John S. Redditt, chn., Austin, grading, structures, flexible base and double asphaltic surface treatment 3.654

CEMENT GUN COMPANY

"GUNITE" CONTRACTORS

GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



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We can similarly solve your problem if you have an old leaky or disintegrated reservoir. We invite you to call on us for complete information, recommendations or estimates on any "GUNITE" work which you may be planning.

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New indispensable Equipment for Contractors, Railroads, Mines and all public and private Construction Departments.

Plastic and Fluid Pressure Grouting, Pneumatic Concrete Construction, Railway Track and Soil Stabilization, Correction of Structural Deficiencies, Subsiding Foundations, Floors, Drypack Concrete and many other practical uses.

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2 and 5 Stage Jetting Pumps Available

COMPLETE WELLPOINT SYSTEMS

COMPLETE MACHINERY & EQUIPMENT CO. INC.
Long Island 1, N. Y.
BRANCH WAREHOUSE—Gary, Ind.

STREETS AND ROADS (Bids Asked, Co
mi. Hy. U.S. 90, Proj. F. 324 (15), Terrell
$188,000; 12.337 mi. Hy. 114, Proj. S. 99
and (2), Wise and Montague Counties, $1
000; grading, structures, roadbed treat
and hot mix sand asphalt surface 16.962
Hy. U.S. 181, C. 101-2 and 3-11 and 7
and San Patricio Counties, $185,000; asp
underseal for concrete pavement 72.67
U.S. 75 and 175 and State 31, Projects C
6-19, etc., Navarro and Kaufman Coun
$245,000; grading, structures, flexible base
base preservative 6.307 mi. Hy. 85, Proj
299-1-8, Val Verde Co., $128,000; grad
drainage structures, G. C. & S. F. R. R. und
pass base and surfacing Hy. U.S. 190, Pr
FAGH 767 (2) and F. 767 (5), McCulloch
$82,000; grading, structures, flexible base
single asphalt surface treatment 4.322
Hy. FM 549, Proj. S. 1124 (1), Rockwall
$74,000; hot mix asphaltic concrete pav
18.846 mi. Hy. 26 and U.S. 84, Proj. F. 203 (1
Cont 2, Rusk Co., $195,000; grading, structure
railroad grade separations, flexible base
asphalt surface treatment 3.862 mi. Hy. 5
Proj. UI 1082 (1) and UGI 1082 (2), Tarra
Co., $1,965,000; grading, structures, stabiliz
foundation course and double asphalt surfa
treatment 12.725 mi. Hy. FM 402 and 40
Proj. S. 1053 (1) and S. 1054 (1), Terry Co
$76,000; flexible base and base preservatives
6.666 mi. Hy. FM 523, Proj. S. 272 (1), Bra
zoria Co., $125,000; grading, structures, 7.72
mi. Hy. U.S. 80, Proj. F. 52 (8) and FI 52 (7
Callahan Co., $515,000; grading, structures
stabilized foundation course and single asphalt
surface treatment 10.812 mi. Hy. FM 426 and
156, Proj. S. 1117 (1) and S. 1145 (1), Denton
Co., $80,000; grading, structures, roadbed treat
ment and single asphalt surface treatment
7.296 mi. Hy. FM 335, Proj. S. 1134 (2),
Edwards and Real Counties, $156,000; grading
structures, flexible base and seal coat 4.282 mi.
Hy. FM 519, Proj. S. 346 (1), Galveston Co.,
$165,000; grading, structures, flexible base and
asphalt surface treatment 8.658 mi. Hy. FM
261 and 265, Proj. S. 987 (1) and S. 1019 (1),
Dickens Co., $78,000; grading, flexible base
and single asphalt surface treatment 17.911 mi.
Hy. 239, Proj. F. 655 (2), Goliad Co., $162,000;
grading, structures, flexible base and asphalt
surface treatment 12.184 mi. Hy. FM 192,
S. 684 (1), Hudspeth Co., $163,000. D. C.
Greer, Austin, engr.

Bids Asked January 19

Neb., Oxford—City, Miss K. Kahle, clk., imprv. 27,000 lin. ft. curb and gutter, 56,416 lin. ft. unreinforced pavement, 15,000 ft. grading. Over $50,000. H. A. Davis, 517 Commercial Bldg., St. Paul, Minn., engr.

Bids Asked January 20

†Tex., Orange—W. Sihler, Capt. (CEC), USN, Officer-in-Charge of Construction, Bldg. 16, Naval Station, New Orleans, La., access roads and structures, incl. earthwork, storm sewers, rein.-con. paving, concrete sidewalks, bituminous surfacing on flexible base, timber retaining wall, underpass protection, bridge structures, fences and gates, etc. at Naval Station, Spec. 18702. Plans deposit $10. CD 9/23—ENR 10/16.

LOW BIDDERS

California — State Div. Hys., Sacramento, Dec. 10, imprv. 5.3 mi. Shasta Co., from Fredrickson Bros., 1259 65 Ave., Emeryville, **$588,829**; 4.3 mi. Inyo Co., from Basich Bros. Constr. Co., and Basich Bros. and O. B. Pierson, Box 151, Alhambra, **$205,322.** CD 11/17—ENR 11/20.

Calif., San Francisco—Dpt. P. Wks., City Hall, Dec. 10, imprv. Industrial St. between Bayshore Blvd. and Oakdale Ave., from Fay Imprvt. Co., 760 Market St. **$50,907.** Ralph Wadsworth, San Francisco, city engr.

Idaho—State Hy. Dpt., Boise, Dec. 5, imprv. 9.9 mi. Blaine Co., from H. A. Gardner, Blackfood. **$460,111.** CD 11/26.

Kentucky—State Dpt. Hys., Frankfort, rejected bids Dec. 5, imprv. 2.963 mi. Pike Co. L.B. **$110,044.** CD 12/15—ENR 12/18, under LB.

Louisiana—State Dpt. Hys., Baton Rouge, Dec. 5, imprv. 0.667 mi. Calcasieu Parish, from W. R. Aldrich Co., P. O. Box 1751, Baton Rouge, **$533,684**; 2.781 mi. Cameron Parish, from Flenniken Constr. Co., P. O. Box 634, Shreveport, **$216,528.** CD 11/6—ENR 11/13.

North Carolina—State Hy. Dpt. & P. Wks. Comn., Raleigh, Dec. 16, imprv. 10.92 mi. Halifax Co., from Nello L. Teer Co., Box 1131, Durham, **$174,365** est. $175,000-200,000*** 13.17 mi. Columbus Co. and 6.18 mi. Columbus Co., from Sloan Constr. Co., Inc., Box 747, Greenville, S. C., **$214,818** est. $250,000-$300,000 and **$192,895** est. $125-$150,000 respectively*** 5.61 mi. Moore Co. and 7.12 mi. Burke Co., from E. W. Grannis Co., Box 231, Fayetteville, **$121,325** est. $125,000-$150,000 and **$226,303** est. $200,000-$225,000 respectively*** 8.99 mi. Jones and Lenoir Counties, from Barrus Constr. Co., Box 561, Kinston, **$157,722** est. $125,000-$150,000***. 10.17 mi. Johnston and Nash Counties from Wayne Engr. & Constr. Co., Box 265, Mt. Olive, **$154,588**, est. $175,000-$200,000*** 5.91 mi. Anson Co., from Kiker & Yount, Reidsville, **$80,039** est. $50,000-$75,000*** 3.79 mi. Wilkes Co., from Suber & Co., Inc., Box B, Whitmire, S. C., **$96,030** est. $100,000-$125,000. CD 12/5—ENR 12/11.

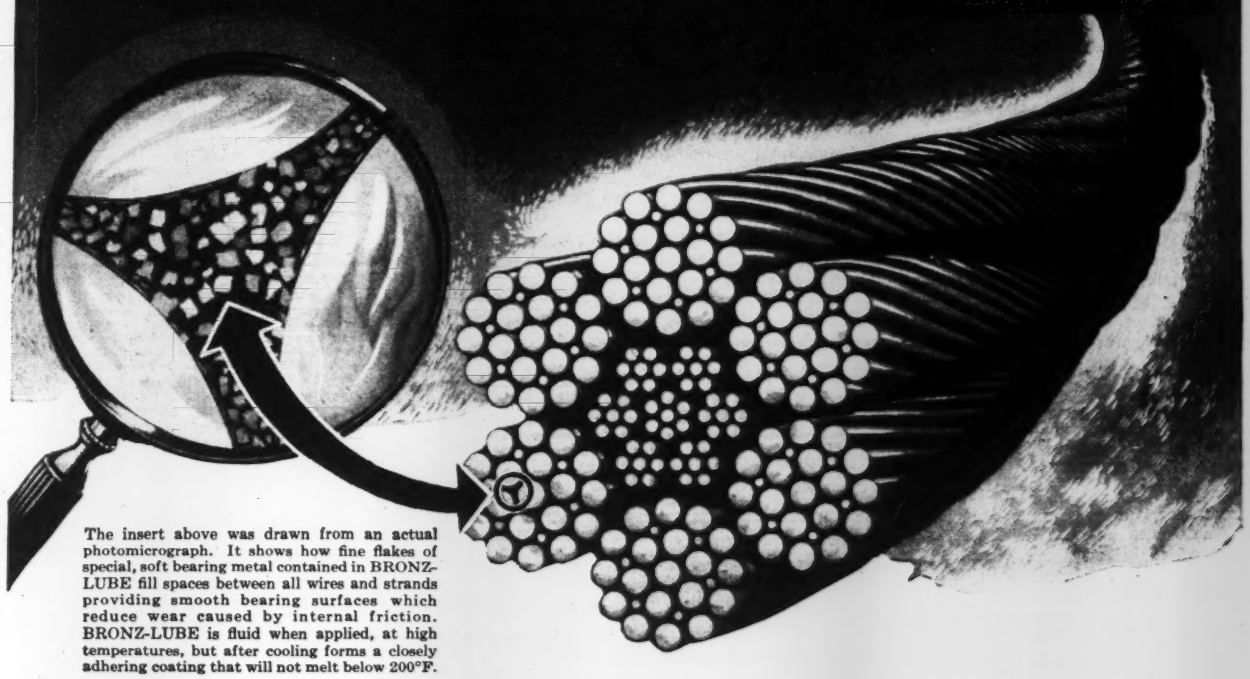
South Carolina—State Hy. Dpt., Columbia, rejected bids Nov. 18, imprv. 0.418 mi. Greenville C. L.B. **$91,798.** CD 11/24—ENR 11/27, under LB.

For Longer Service Life

ALL J&L PERMASET PREFORMED WIRE ROPE

Now Lubricated with **BRONZ-LUBE...**

J&L STEEL



The insert above was drawn from an actual photomicrograph. It shows how fine flakes of special, soft bearing metal contained in BRONZ-LUBE fill spaces between all wires and strands providing smooth bearing surfaces which reduce wear caused by internal friction. BRONZ-LUBE is fluid when applied, at high temperatures, but after cooling forms a closely adhering coating that will not melt below 200°F.

. . . Containing soft alloy bearing metal that plates each wire and strand for longer wear!

Wire ropes are machines and like all machines need the best lubricant to give long service life. BRONZ-LUBE a new exclusive J&L wire rope lubricant, contains minute particles of soft anti-friction bearing metal. This new expensive lubricant with exceptional qualities for adhering to steel has been developed through months of research by J&L wire rope engineers and lubrication experts. Each individual wire, each strand and the entire J&L wire rope is coated with this superior, longer lasting lubricant. It reduces wear caused by internal friction when the rope is working under heavy loads and flexing over sheaves and drums. BRONZ-LUBE having a high film strength of 50,000 lbs. per square inch will not "squeeze out" between rope wires under extreme lateral pressures.

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STREETS AND ROADS (Cont'd.)

CONTRACTS AWARDED

Connecticut—State Hy. Dpt., G. Albert [illegible] comr., Hartford, grading, drainage 19.5[illegible] mi. U.S. Route 1, to Savin Constr. Corp., 10 V[illegible] St., East Hartford. **$768,095.** Bids 11/17. CD 11/21—ENR 11/27.

Kansas—State Hy. Dpt., Garnett, to H[illegible] Henery, Ottawa, imprv. 7.627 mi. Miami [illegible] **$191,965;** 2.388 mi. Franklin Co., $54,1[illegible] 12.785 mi. Anderson Co., **$312,279;** to Jero[illegible] Wille, Iola, 11.28 mi. Bourbon Co., $61,3[illegible] Grand total $619,757. Bids 12/2. CD 11/[illegible]—ENR 11/27.

La., Oakdale—City, paving 4 streets, to Flynn Mfg. Co., Alexandria. Approx. **$50,000.** Bids 12/11. CD 11/25—ENR 12/4.

Montana—State Hy. Comn., Helena, impr[illegible] 5.141 mi. Sanders Co., to McCartney & Schu[illegible] Veradale, Wash., **$95,301** est. $84,000***2.763 mi. Missoula Co., to F. and S. Contg. Co., Butte, **$118,552** est. $122,000***0.5 mi. Big Horn Co., to W. P. Roscoe Co., Box 633, Billings, **$99,957** est. $102,610. Grand total $313,8[illegible] Bids 12/10. CD 11/6—ENR 11/13.

Mont., Helena—City, City Hall, sidewalks, curbs, water sys, replacements, storm sewer addn., in Imprvt. Dist. 160, southeast of Main and 11 Sts., to S. J. Groves & Sons Constr. Co., 510 Wesley Temple Bldg., Minneapolis, Minn. **$633,466.** Bids 11/26. CD 12/10—ENR 12/18, under LB.

South Dakota—State Hy. Comn., Pierre, storage piles in Lawrence, Butte and Meade Counties, to Cole Constr. Co., Spearfish. **$65,000.** CD 12/2.

EARTHWORK, WATERWAYS

BIDS ASKED

Bids Asked December 30

†Illinois—U. S. Eng., U. S. Courthouse & Custom House, St. Louis 1, Mo., levees, Stringtown-Ft. Chartres and Ivy Landing Drainage and Levee Districts, Proj. Item II B, Randolph Co., Serial No. W-23-065-eng-48-81.

Bids Asked January 5

†California—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, imprv. Los Angeles River imprv. Lankershim Blvd. to Vineland Ave. River Mile 35.40 to River Mile 36.32, Vineland Ave. to Tujunga Wash River Mile 36.32 to River Mile 37.71 Los Angeles Co. Drainage Area, Serial No. W-04-353-eng-48-19.

Bids Asked January 6

Louisiana—State Dpt. Finance, 201 Capitol Bldg., Baton Rouge, furnishing, installing complete 4 sets operating machinery and electrical controls, electric lights, signal lights, and day signals, etc., at navigation lock, Empire, Plaquemine Parish.

Bids Asked January 7

†California—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, dredging Los Angeles and Long Beach Harbors, Serial No. W-04-353-eng-48-21.

†Oregon and California—Bureau Reclamation, Dpt. Interior, Klamath Falls, constructing Pumping Plants G, H, J, K, L, and M, Coppeck Bay Exten., Klamath Proj., Spec. 2045.

†Wash., Tacoma—U. S. Eng., 4735 E. Marginal Way, Seattle, 4.4 mi. levee, rectification of 2.2 mi. Puyallup River channel and constructing railway transfer bridge, Serial No. W-45-108-48-30. $764,000. CD 10/21—ENR 10/23.

Ont., Port Hope—J. M. Somerville, secy. Dpt. P. Wks., Hunter Bldg., Ottawa, Ont., harbor repairs, (East Breakwater), Durham Co. Approx. $160,000. Plans deposit $10. R. Blais, c/o owner, engr.

Bids Asked January 8

Mont., Hysham—St. Bd. Examiners, Helena, pumping project in Hysham area. $220,000. F. Buck, c/o owner, engr. CD 11/10—ENR 11/27.

†Oregon and California—Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., third pumping units and motor-control equip. for Pump. plants E and F, Modoc Unit, Tule Lake Div., Klamath, Proj. Spec. 2022. Extended date. CD 11/21—ENR 11/27.

Bids Asked January 9

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, Zone 9, clearing West Atchafalaya Floodway, No. T. and M.R.R. High Level Crossing, Serial No. W-16-047-eng-48-254.

Bids Asked January 13

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, Zone 9, Big Creek Channel enlargement and realignment, from Mile 26 to Mile 45 Franklin and Richland Parishes, New Orleans Dist., Serial No. W-16-047-eng-48-270.

Bids Asked January 14

†California—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, Ventura River imprv., Ocean to Canada De San Joaquin, construction of levee, Ventura River Basin, Serial No. W-04-353-eng-48-22.

†N. Y., Elmira—U. S. Eng., 24 St. and Maryland Ave., P. O. Box 1715, Baltimore 3, Md., Elmira Flood Protection Proj., Sect. 3, Unit 1, Chemung Co., Serial No. W-18-020-eng-48-22. Bid date change. CD 11/21—ENR 11/27.

EARTHWORK, WATERWAYS (Bids Asked, Cont'd.)

Bids Asked January 15

†Florida—U. S. Eng., P. O. Box 4970, Jacksonville, dredging St. Lucie Inclet, Serial No. W-08-123-eng-48-50.

†Florida—U. S. Eng., P. O. Box 4970, Jacksonville, deepening section St. John's River Navigational Channel to 34 ft. between Jacksonville and the Ocean, consisting dredging 5½ mi. north portion of Long Branch cut, all of Trout River cut, Drummond Creek cut, Dunns Creek cut, Brills cut and east portion of Dames Point, approx. 2,500,000 yd. material, Duval Co. CD 6/19/44—ENR 6/29/44.

Bids Asked January 20

†Oklahoma — U. S. Eng., Wright Bldg., Tulsa, Heyburn earth fill dam on Polecat Creek, Creek Co. $850,000.

Bids Asked About January 21

†Arkansas—U. S. Eng., Little Rock, furnishing, installing tainter gates and operating machinery for Norfork Dam, Mountain Home, Baxter Co., Serial No. W-03-050-48-63.

Bids Asked On or About January 22

†Arkansas—U. S. Eng., Little Rock, furnishing, installing floodwall and pump station at Van Buren, Crawford Co., Serial No. W-03-050-eng-48-60.

Bids Asked About January 28

†Ohio—U. S. Eng., Madison Ave. and 8 St. W., Huntington, 18, W. Va., outlet works Burr Oak Reservoir Proj. East Branch of Sunday Creek, approx. 0.3 mi. above the confluence of the East Branch of Sunday Creek and Sunday Creek in Athens Co. about 3 mi. north of Village of Glouster, and about 4 mi. southeast of Village of Corning.

Bids Asked January 28

†Texas—U. S. Eng., 606 Santa Fe Bldg., Galveston, gate frames, leafs and hoists, Addicks and Barker Dams, Inv. No. W-41-243-eng-48-107. Extended date. CD 12/15—ENR 12/18.

Bids Asked On or About January 29

†Nebraska—U. S. Eng., 601 Davidson Bldg., Kansas City 8, Mo., completing earth and concrete, Harlan County Dam, Harlan Co., Inv. No. W-23-028-eng-48-141. Tentative date.

Bids Asked February 10

†California — Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars, shipping point or Bethany, 6 pump-motor unit control boards, 1 indoor unit substation, 1,500-kva capacity, with noninflammable-liquid-filled transformers, 1 indoor unit substation, 1,500-kva capacity with air-cooled, dry-type transformers, for Tracy Pumping Plant, 1 main control board, 1 indoor unit substation, 600-kva capacity with noninflammable-liquid-filled transformers, 1 indoor unit substation, 600-kva capacity, with air-cooled, dry-type transformer for Tracy Switchyard, Central Valley Proj., Spec. 2059.

LOW BIDDERS

●**†Arkansas**—U. S. Eng., 300 Broadway, Little Rock, furnishing 3 turbines, Blue Mountain Dam, Mountain Home, from Allis Chalmers Mfg. Co., 1126 S. 70 St., Milwaukee, Wis. **$1,626,575.**

†Delaware—U. S. Eng., 1400 Penn Mutual Bldg., Phila., Pa., jetty, Mispillion River, from George S. Schkley, Rehoboth Beach. **$43,710.** CD 11/7—ENR 11/13.

†Delaware—U. S. Eng., 1400 Penn. Mutual Bldg., Phila., Pa., rejected bids Oct. 22, dredging entrance channel in Delaware Bay and Smyrna River, vicinity of Princess Landing, Kent Co., Serial No. W-36-109-48-32. **$63,070.** CD 10/15.

†Illinois—U. S. Eng., Clock Tower Bldg., Rock Island, cancelled bids to have been opened Dec. 18, constructing right bank drainage and closure structure, Local Protection Proj., Galena River, Galena, Serial No. W-11-117-eng-48-36.

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, Zone 9, Dec. 12, foundation and concrete work, north end of Bayou Sorrel Lock, from J. R. McDermott & Co. Inc., P. O. Box 383, Harvey. **$949,460.** CD 11/19—ENR 11/27.

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, Zone 9, Dec. 11, approx. 600,000 cu. yd. semi-compacted earthwork and 6,008 lin. ft. gravel surfaced road, St. James Parish, Serial No. W-16-047-eng-48-236, from W. P. Villere, 1100 S. Claiborne St., New Orleans. **$183,728.** CD 12/2—ENR 12/4.

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, Zone 9, Dec. 11, approx. 380,000 cu. yd. semi-compacted levee enlargement in south bank of Red River Levees, Rapides Parish, Serial No. E-16-047-eng-48-229, from Hooper Constr. Co., 1125 Kings Ave. S., Jacksonville, Fla. **$98,230.** CD 11/26—ENR 12/4.

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, Zone 9 Dec. 11, approx. 784,000 cu. yd. uncompacted levee embankment and approx. 8,128 lin. ft. gravel surfaced highway, Point Coupee Parish, Serial No. W-16-047-eng-48-235, from Jones & Buchanan, P. O. Box 1733, Alexandria. **$198,472.** CD 12/2—ENR 12/4.

La., New Orleans—Orleans Levee Dist., 200 Civil Courts Bldg., cancelled bids to have been opened Dec. 9, approx. 600,000 cu. yd. hydraulic fill along south shore at Lake Pontchartrain. A. L. Willoz, Civil Courts Bldg., engr.

†New Jersey — U. S. Eng., Penn Mutual Bldg., Phila., Pa., Dec. 2, dredging Raccoon Creek, Gloucester Co., from Conduit & Foundations Corp., 770 S. Schuylkill Ave., Phila., Pa. **$47,560.** CD 10/31—ENR 11/6.

†Oregon—U. S. Eng., Pittock Block, Portland, channel clearing in Conn Ford area and constructing bank protection in Melrose area along South Umpqua River, Douglas Co., Inv. No. 35-026-48-375, from Oscar Butler & Son, 4910 NE. 42 St., Portland, **$32,740.** Est. $25,781. CD 12/2—ENR 12/4.

†Oregon—U. S. Eng., Pittock Block, Portland, Dec. 11, bank protection work along left bank of Willamette River at Half Moon bend, 4 mi. northeast of Corvallis, Benton Co., Inv. No. 35-026-48-343, from Ramsey Constr. Co., Corvallis, **$81,510.** Est. $106,448. CD 11/20—ENR 11/27.

†South Carolina—U. S. Eng., 1 and Douglas Sts. N. W., Wash. 25, D. C., removing 1,394,800 cu. yd. material from Intracoastal Waterway Georgetown, Charleston and Beaufort Counties, from Atkinson Dredging Co., Great Bridge, Va., **$227,910;** 233,000 cu. yd. material from Intracoastal Waterway, Charleston and Beaufort Counties, from Merritt Dredging Co., Berkeley Court Apartments, Charleston. **$40,434.** CD 6/9/44—ENR 6/29/44.

†Texas—U. S. Eng., 606 Santa Fe Bldg., Galveston, Dec. 9, levee repairs, Kaufman Co. Levee Imprvt. Dist. 4, Trinity River and tributaries, Inv. No. W-41-243-eng-48-156, from J. W. Robertson, Springtown. **$80,325.**

CONTRACTS AWARDED

Que., Quebec City—Dpt. P. Wks., Quebec City, water course to drain lands, Pierre Fevrier Laramee, to Philippe Baillargeon, 227 Champlain St., St. Johns. Approx. **$50,000.** CD 5/8/46—ENR 5/30/46.

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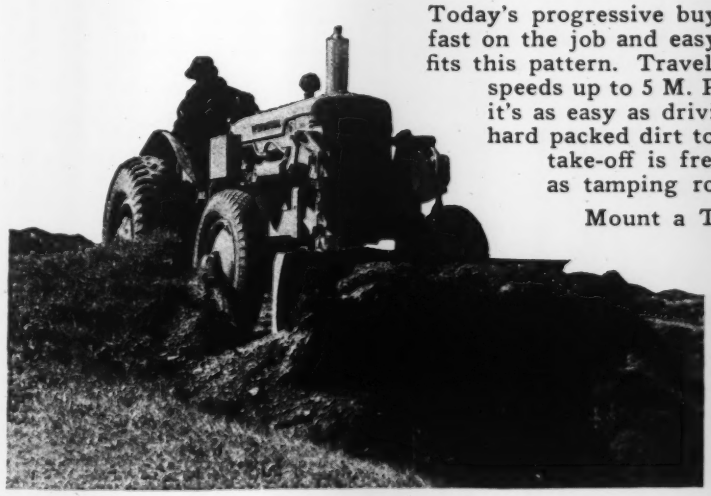

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BIDS ASKED

Bids Asked December 29

N. Y., Idlewild—AIRPORT—At Office Chief Engineer Port of New York Authority, 111 Eighth Ave., New York, placing fill and performing incidental excavation on the site of Runway V at New York International Airport, Contr. NYA-11. Plans deposit $1[illegible].

Va., Newport News—AIRPORT—Peninsula Airport Comn., H. K. Peebles, chn., Newport News, clearing, grubbing, grading concrete paving runway and taxiway. Plans deposit $25. R. F. Pyle, Williams, Coile & Pipkin, 208 Citizens Marine & Jefferson Bank Bldg. and 403 Melson Bldg., Newport News, engrs. and archts. CD 1/24—ENR 2/6.

Bids Asked January 12

N. Y., Idlewild—AIRPORT—At Office Chief Engineer Port of New York Auth., 111 Eighth Ave., New York, Zone 11, Thurston Sewer exten. at New York International Airport, Contr. NYA-3 Plans deposit $25.

LOW BIDDERS

Ind., South Bend—AIRPORT—Bd. Aviation Comrs., A. W. McGann, pres., Dec. 11, airport imprvs., addnl. terminal bldg., from S-L-A-B Constr. Co., 412 Platt Bldg. $393,297. Est. $340,450. CD 11/19—ENR 11/27.

N. Y., Watertown — ADMINISTRATION BLDG.—City, 2 story administration bldg. at airport, from Haas Constr., Inc., 1101 Monroe St., Jamestown. $89,997. Est. $80,000. CD 10/31—ENR 11/6.

†**N. C., Cherry Point (br. New Bern)**—AIRPORT IMPRVS.—Officer-Charge-Construction, Marine Corps Air Station, Dec. 3, replacement of Air FM Plant facilities, Spec. 1897S, from T. A. Loving & Co., Goldsboro. $84,675. CD 11/19.

LATIN AMERICA

Argentina, Buenos Aires—Direccion de Hidraulica, Buenos Aires, receiving bids drainage project, exten. about 24,000 ft. from Belgrano St. in Villa Dominico to Avellaneda Railroad. Approx. $300,000. CD 10/16—ENR 10/31.

Argentina, Buenos Aires—Minister of Pub. Wks., Buenos Aires, receiving bids until January 15, Hangars 1, 2, 3, 4, 5, and 6 at National Airport. $7,750,000. Extended date. CD 11/13—ENR 11/20.

PUBLIC BUILDINGS

BIDS ASKED

Bids Asked December 30

N. J., West Orange—Bd. Educ., Town Hall, school alterations, addns. Hacker & Hacker, 291 Main St., Fort Lee, archts. CD 4/16/46—ENR 7/14/46.

†**N. Y., St. Albans**—Pub. Wks. Office, 90 Church St., New York, Zone 7, electrical work at Naval Hospital. Plans deposit $10. CD 11/10—ENR 11/27.

†**Pa., Johnsville**—Pub. Wks. Office, Naval Base, Phila., officers quarters.

Bids Asked January 7

†**Calif., San Jose**—P. Wks. Dpt., 12 Naval Dist., Federal Office Bldg., San Francisco, Naval Reserve Armory, NOY 14855, Spec. 18876. Plans deposit $15.

†**Tenn., Oak Ridge**—Roane-Anderson Co., P. O. Box 456, Railroad Operations Office Bldg. 16051 and addn. to Central Steam Plant Bldg. 1401, Inv. 48-6.

Que., Lacolle—J. M. Somerville, secy., Dpt. P. Wks., Hunter Bldg., Ottawa, Ont., customs and immigration bldg. Approx. $260,000. Plans deposit $50. G. G. Brault, c/o owner, engr.

●**Wash., Seattle**—State Liquor Control Bd., 301 Public Lands-Social Security Bldg., Olympia, 320 x 760 ft. terminal warehouse, mill constr. $1,250,000. Plans deposit $25. L. E. Gregory, bd. chn. and consult. engr.

Bids Asked January 8

Fla., Jacksonville — City, furnishing, installing (3) 37,500 kva transformers and 2 sets spare parts. Reynolds, Smith & Hills, 10 S. Laura St., engrs. CD 2/12—ENR 3/6.

Tex., Lubbock — Bd. Educ., Independent School Dist., masonry Dunbar School addn. and heating plant bldg. $275,000. Haynes & Kirby, 19 St. and Dixie Dr., engrs. and archts. CD 11/12—ENR 11/27

Wash., Wapato—School Dist. 206, Wapato, school. $350,000. Plans deposit $25. W. H. Rothe, 333 Liberty Bldg., Yakima, archt. CD 8/22/46—ENR 9/5/46

B. C., Vancouver—Sharp & Thompson, Berwick, Pratt, archts., 626 W. Pender St., Biological Science and Pharmacy Bldg., at University of British Columbia, for Dpt. P. Wks., Victoria. Approx. $550,000. Plans deposit $25. Extended date. CD 11/18—ENR 11/20.

PUBLIC BLDGS. (Bids Asked, Cont'd.)

Bids Asked January 9

Ont., Niagara Falls—A. B. Scott, archt., 112 Division St., Welland, 6 room school unit, Drummond Rd. School, 6 room school unit, Dorchester Rd. School, for Bd. Educ., Stamford Twp. Approx. $260,000. Plans deposit $10.

Bids Asked January 13

Md., Middle River — Baltimore Co. Bd. Educ., Susquehanna and Washington Aves., Towson, two 1 story, bsmnt., 62 x 88 ft., brick steel school addns., $250,000. W. B. Gray, 12 E. Pleasant St., Baltimore, archt. Crout, Snyder & Crandall, 20 E. Lexington St., Baltimore, structural engrs. George & Hartmen, 105 E. Pleasant St., Baltimore, mechanical engrs. CD 10/9—ENR 10/30.

Bids Asked January 13

Tex., San Antonio—City Public Service Bd., 217 N. St. Marys St., 2 story, rein.-con. brick, hollow tile service bldg., pier and beam fdn. $90,000. Plans deposit $25. Phelps & De Wees & Simmons, 1501 Majestic Bldg., archts. CD 8/21—ENR 9/4.

Bids Asked January 19

N. J., Union Twp.—Bd. Educ. 2 and 3 story Union High School addn., alterations. Plans deposit $25. Frederick A. Elsasser, 2013 Morris Ave., Union, archt.

†N. M., Albuquerque—U. S. Eng., P. O. Box 1538, addnl, housing facilities, Sandia Base, Albuquerque, Serial No. W-29-005-eng-48-27. Extended date. CD 12/8—ENR 12/11.

Bids Asked January 20

†Calif., Inyokern—P. Wks., Office, Naval Ordinance Test Station, Inyokern, primary school and altering commissary NOTS, NOY 14878, Spec. 18898.

Bids Asked January 21

●**Vt., Montpelier**—State Bldg., Comn., State House, state office bldg. $1,350,000. Plans deposit $50. Freeman, French & Freeman, 130 Church St., Burlington, archts.

Bids Asked January 22

● **†Mich., Iron Mountain**—U. S. Eng., 428 Federal Bldg., Milwaukee, Wis., 5 story, brick, steel concrete veterans hospital for Veterans Admin., Vermont Ave. between H and I Sts., N.W., Wash., 25, D. C. $4,630,000. Extended date. Fugard, Olsen, Urbain & Neiler, 19 S. LaSalle St., Chicago, Ill., archts. CD 12/8—ENR 12/11.

†Washington — Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., generator-voltage bus structures for Units R-1, R-2, and R-3, Grand Coulee Power Plant, Columbia Basin Proj., Spec. 2015. Extended date. CD 11/11—ENR 11/20.

†Washington—Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Bldg., Denver, Colo., furnishing nine 43,000 kva, 13,600-132,800/230,000 Y-volt, single-phase outdoor transformers for units R-4, R-5, and R-6, Grand Coulee Power Plant, Columbia Basin Proj., Spec. 2048.

†Washington—Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., furnishing electric power control switchgear and related equip. for Grand Coulee right powerhouse, Columbia Basin Proj., Spec. 2051.

Bids Asked January 26

†Pa., Altoona—U. S. Eng., 925 New Federal Bldg., Pittsburgh Zone 19, veterans general medical hospital for Veterans Admin., Vermont Ave. between H and I Sts. N. W., Wash. 25, D. C., Serial No. W-36-058-eng-48-110. CD 3/10—ENR 3/13.

Bids Asked January 27

†N. D., Fargo—Veterans Admin., Branch Office 8, Fort Snelling, St. Paul, Minn., Coal Storage Silo Bldg. 23 and coal handling equip. at Veterans Hospital, No. 8-4010. CD 11/21—ENR 11/27, under LB.

Bids Asked February 2

†Pa., Wilkes-Barre—U. S. Eng., P.O. Box 1715, Baltimore 3, Md., hospital for Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash., 25, D. C. Plans deposit $50. Extended date; adv. ENR 12/25. CD 11/21—ENR 11/27.

Bids Asked February 18

Ore., Klamath Falls—Klamath Co., Courthouse, 3 story, 126 x 180 ft. rein.-con., brick county-city jail. Sheldon Brumbaugh, Route 2, Box 812, archt. CD 7/30/45—ENR 8/9/45.

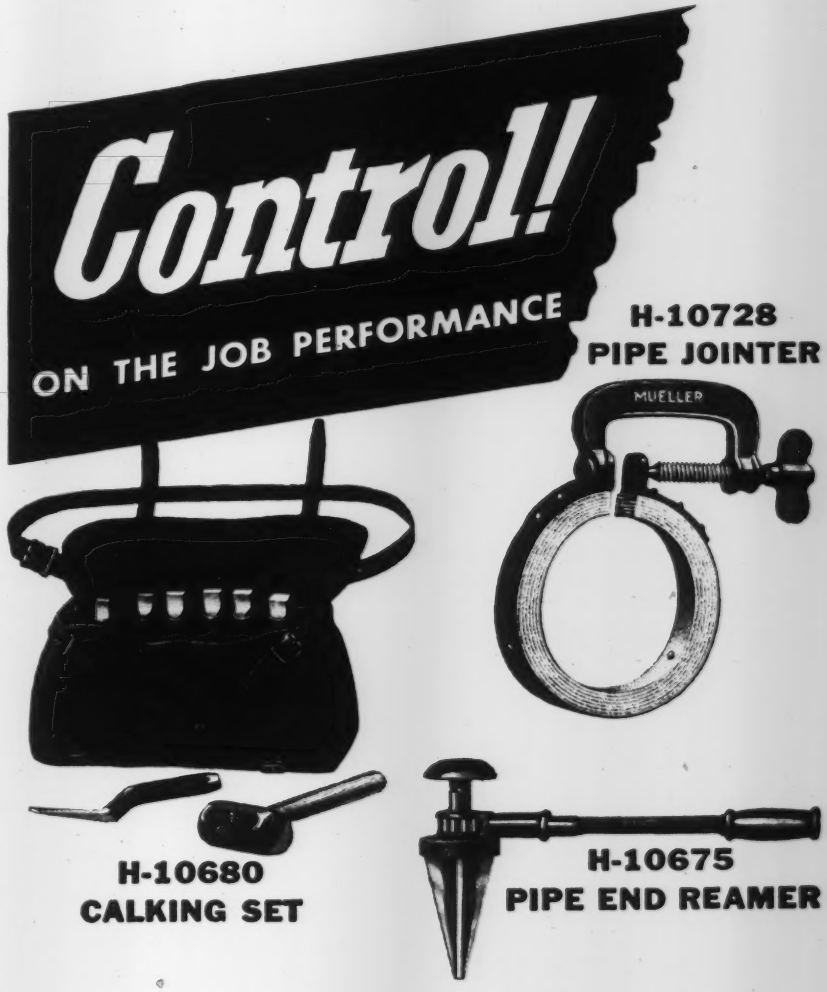
Bids Asked February 19

†N. Y., Albany—U. S. Eng., 120 Wall St., New York, Zone 5, superstructure Veterans Hospital, for Veterans Admin., Vermont Ave. between H and I Sts. N. W., Wash. 25, D. C., Extended date. CD 12/17—ENR 11/6.

Bids Asked February 24

†Ore., Portland—Veterans Admin., Vermont Ave. between H and I Sts. N. W., Wash. 25, D. C., TB Hospital Bldg. 25. CD 10/15—ENR 10/30.

●**†Wash., Spokane**—U. S. Eng., 4735 E. Marginal Way, Seattle, Zone 4, 8 story, rein.-con. main hospital bldg., rein.-con. power house and laundry bldg., six rein.-con., frame auxiliary bldgs., roads, walks, parking areas and accessory utilities for veterans hospital for Veterans Admin., Vermont Ave. between H and I Sts. N. W., Wash. 25, D. C. $3,750,000. Plans deposit $50. J. Graham, Dexter Horton Bldg., Seattle, Zone 1 and G. M. Rasque & Son, Washington Trust Bldg., archts. CD 1/31—ENR 2/20.



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PUBLIC BLDGS. (Cont'd.)

LOW BIDDERS

Calif., Hayward — Hayward Union High School Dist., Foothill Blvd., Dec. 10, concrete gymnasium, at Hayward Union High School, from John E. Branagh, 105 Sheridan Ave., Piedmont. **$617,777.** CD 11/6—ENR 11/13.

Md., LaPlate—Bd. Educ., Charles Co., T. B. R. Mudd, chn., LaPlate, Nov. 20, masonry Senior High School, from W. F. Sutter, Nescopeck, Pa. **$715,209.** J. J. Baldwin, 927 15 St. N. W., Wash., D. C., archt.

†Montana—Bureau Reclamation, Dpt. Interior, N. Warren St., Helena, Dec. 4, 15 dwellings, dormitory, office, garage and shop, from Dudley Constr. Co., Great Northern Yards, Great Falls. **$324,259.** CD 11/6—ENR 11/13.

†N. J., Newark—U. S. Eng., 120 Wall St., New York 5, N. Y., Dec. 16, excavation and foundation work for veterans hospital, for Veterans Admin., Vermont Ave. between H and I Sts. N. W., Wash. 25, D. C., from Terminal Constr. Corp., 194 Hackensack St., Woodridge. **$674,990.** CD 12/2—ENR 12/4.

●N. Y., Orchard Park—Orchard Park Central School Dist. 1, Orchard Park, Junior-Senior High School, from William Borneman, Inc., 1681 Fillmore Ave., Buffalo. **$1,247,098.** CD 5/14/46—ENR 7/11/46.

CONTRACTS AWARDED

†Calif., San Fernando—Veterans admin., Vermont Ave., between H and I Sts., N.W., Wash. 25, D. C., general contract 130 bed hospital, to Zoss Constr. Co., 1037 N. Cole Ave., P.O. Box 1167, Hollywood, Zone 38. **$1,882,405.** CD 12/18, under LB.

Ill., Bradley—Bradley & Bourbonnais School Dist. 307, Bradley, 2 story, brick high school and gymnasium, to Corn Belt Contr. Co., Onargo. Est. **$662,000.** CD 11/26—ENR 12/4, under LB.

†Minn., Little Falls—U. S. Govt., U. S. Property & Disbursing Officer for Minn., Little Falls, 1 story, 142 x 400 ft. ordnance maintenance shop, 60 x 200 ft. warehouse, Camp Ripley, to National Builders Inc., 2001½ Foshay Tower, Minneapolis. **$378,189.** Bids 11/13. CD 10/29—ENR 11/6.

Mo., Kirksville—Northeast Missouri State College, c/o Bd. Regents and W. L. Smith, state purch. agt., Baldwin Hall, 3 story, bsmnt., 36x184½ ft. with 85 ft. L; brick, stone, structural tile block, rein.-con. Dormitory A, 41x119 ft. Dormitory B, portion only, 36x52 ft. Dormitory C to McCarthy Bros. Constr. Co., 4903 Delmar Blvd. **$746,800.** Bids 12/3. CD 12/11—ENR 12/18, under LB.

●Wash., Fort Steilacoom—State Dpt. P. Institutions, Olympia, rough structure of hospital ward bldg. at Western State Hospital to Macdonald Building Co., 1517 South Tacoma Way, Tacoma. **$1,231,000.** CD 11/26—ENR 12/4, under LB.

●†Neb., Grand Island—U. S. Eng., 1709 Jackson St., Omaha, Zone 2, 200-bed general medical hospital. Serial No. 25-066-45-132, for Veterans Admin., Vermont Ave. between H and I Sts. N. W., Wash. 25, D. C., to Henry Carlson, 110 E. 10 St., Sioux Falls, S. D., and Lovering Constr. Co., 618 Guardian Bldg., St. Paul, Minn. **$5,244,854.** Bids 12/15. CD 11/6—ENR 11/13.

Tenn., Nashville—State Bd. Educ., State Office Bldg., 2 boys dormitory at Tennessee Industrial School, to C. F. Rule Constr. Co., Stahlman Bldg. **$276,405.** CD 8/21—ENR 9/4.

Tex., Denton — T. E. Pennebaker, supt. Power Plant, Denton, power plant bldg. and fdn., to Carpenter Bros., 1335 Plowman St., Dallas. **$98,214.** Wilson & Patterson, 209 Majestic Bldg., Fort Worth, archts. CD 6/30—ENR 7/10.

B. C., Surrey—Surrey School Bd., Cloverdale, 2 story, bamnt., frame, stucco Junior-Senior High School, to Olund Bros., Ltd., Mission. Approx. **$250,000.** Bids 11/18. CD 10/30—ENR 11/6.

Que., Val d'Or—Congregation de Fille, 400 Montreal Rd., Eastview, hospital, to F. Marquis & Son, 177 Cremazie, Quebec City. Est. **$500,000** P. Rousseau, 308 St. John St., archt. Lalonde & Valois, Canada Cement Bldg., Montreal, engrs.

COMMERCIAL BUILDINGS

BIDS ASKED

Bids Asked January 7

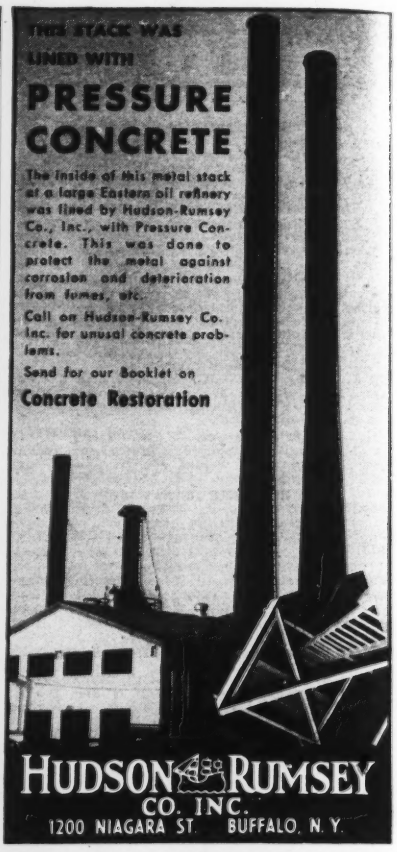
Nev., Fallon—Church Public Hospital, 46 E. Center St., 1 story, concrete block, tile 32-bed hospital. Plans deposit $25. Extended date. DeLongchamps & O'Brien, Gazette Bldg., Reno, archts. CD 11/5—ENR 11/13.

Bids Asked January 10

Ala., Mobile—Southern Bell Telephone Co., Hurt Bldg., Atlanta, office bldg. addn., $325,000. Warren, Knight & Davis, Protective Life Bldg., Birmingham, archts.

Bids Asked About January 15

Tenn., Nashville—David Lipscomb College, Granny White Pk., gymnasium and physical educ. bldg. $250,000. George D. Waller, 3 Natl. Bank Bldg., archt.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1x2—18"	5.25	4.75
1x2—24"	6.20	5.65
1x2—36"	8.80	8.00
2x2—12"	$6.50	$5.90
2x2—15"	8.15	7.00
2x2—18"	8.70	7.90
2x2—24"	10.45	9.50
2x2—36"	15.00	13.65

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COMMERCIAL BLDGS. (Bids Asked, Cont'd.)

Bids Asked

Pa., Allentown—Sacred Heart Hospital, 336 N. 4 St., Monsignor Masson Memorial Bldg. Over $250,000. H. F. Everett & Assoc., 512 Hamilton St., archts.

Wis., Wauwatosa—Milwaukee Co-operative Homes Assn., 2583 N. Murray Ave., Milwaukee, Zone 11, one hundred thirty, 24x26 ft. and 24x26 ft. masonry residences, block fdns. R. A. Sutherland, 264 E. Wells St. Milwaukee, Zone 2, archt. CD 11/12—ENR 12/4.

SOON LETS CONTRACT

N. Y., Hawthorne—Jewish Bd. Guardians, 222 E. 13th St., New York, soon lets contract, recreation bldg. at Cedar Knolls School. Joseph D. Weiss, 2 W. 46 St., New York, Zone 19, archt.

CONTRACTS AWARDED

Ala., Birmingham—Oakmoor Estates, c/o Pembleton & Mims, archts., Title Guarantee Bldg., 45 duplex type homes, to Marbury & Beriss, Massey Bldg. Est. **$254,000.**

●**Calif., San Carlos**—Pacific Telephone & Telegraph Co., 140 New Montgomery St., San Francisco, 2 story, rein.-con. telephone exchange, to H. H. Larson Co., 64 S. Park St., San Francisco. Est. **$1,200,000.** Clarence O. Peterson & Wendell R. Spackman, 45 2 St., San Francisco, archts.

Calif., San Francisco—Apparel City, Inc., 116 New Montgomery St., 1 story, rein.-con. class C apparel center bldg., to Barrett & Hilp, 918 Harrison St. Est. **$250,000.** CD 7/12/45—ENR 7/26/45.

Conn., Ansonia—American Brass Co., 58 Liberty St., 3 story, brick, steel, concrete office, to W. J. Megin, Inc., 51 Elm St., Naugatuck. Est. **$300,000.**

Conn., Bridgeport—Homesites, Inc., 333 Nutmeg Rd., 2 story, bsmnt., 100 unit garden type apartments, to Kesakaun Constr. Co., 211 State St. Est. **$500,000.** Awarded 12/12. CD 4/1—ENR 4/10.

Fla., Miami—Elsener & Stewart, 10750 Biscayne Blvd., residential development, separate contracts. Over **$250,000.**

Fla., Orlando—Gurtler Properties, Inc., c/o Carlos B. Schoeppl, archt., 3520 NW. 49 St., Miami, apartment development. Owner builds. Est. over **$300,000.**

Ill., Elmwood Park—Goldblatt Bros., 333 S. State St., Chicago, 1 story, bsmnt., 175 x 274 ft. department store, to E. J. Marhoefer Jr. Constr. Co., 505 N. LaSalle St., Chicago. Friedman, Alschuler & Sincere, 223 W. Jackson St., Chicago, archts.

●**Ill., Lagrange**—Homestead Apartments, c/o W. Joern & Sons, 3244 N. Cicero St., Chicago, 19 two and three story apartments, Lagrange Park, to Patrick Warren Constr. Co., 815 N. Kedzie St., Chicago. Est. **$3,500,000.** E. T. Mittelbusher & H. T. Fisher & Assoc., 322 W. Washington St., Chicago, archts. CD 11/1/46 ENR 11/14/46.

Ky., Louisville—Home Owners Realty Co., 403 Louisville Trust Bldg., several residential developments, to A. P. Dorsey, c/o owner. Over **$250,000.**

Md., Dundalk—Watersedge, Inc., 286 Fifth Ave., New York, N. Y., 82 masonry residences, Yordway and Waymouth Rds., separate contracts. **$370,000.**

Mont., Hot Springs—Tribal Corp. of Confederated Salish and Koottenai Tribes, Dixon, mineral bath bldg., to Askevold Constr. Co., Higgins Bldg., Missoula. **$350,000.** Perkins & Will, 2200 Jackson Blvd., Chicago, Ill., archts.

●**N. Y., New York** — Basic Builders Corp., 140 Nassau St., Zone 7, four 12 story 150-family co-operative apartments on 8 acre site, 256 St. between Riverdale and Arlington Aves. Owner builds. **$11,000,000.** Charles E. Greenberg, 565 Fifth Ave., Zone 17, archt.

●**N. Y., New York**—Park Avenue Properties, Inc., 2 Lafayette St., Zone 7, 20 story store and office, 101-07 E. 59 St., separate contracts. **$1,500,000.** Emery Roth, 18 E. 49 St., Zone 17, archt. James Rudderman, 32 Union Square, engr. CD 2/5—ENR 2/13.

●**N. Y., Rego Park**—Jewish Center of Rego Park, Inc., 63-61 Wetherole St., temple, recreation center and school, to Lustbader & Co., 415 Lexington Ave., New York. **$614,000.** Bids 7/1. CD 6/30—ENR 7/10.

N. C., Greensboro — Meyers Dept. Store, Greensboro, department store addn., to H. L. Coble Constr. Co., Greensboro. Est. **$1,000,000.** Perry, Hepburn & Shaw, 31 St. James Ave., Boston, Mass., archts. C. C. Macomber, 19 Milk St., Boston, Mass., engr.

O., Fairview Village—Housing Development Corp., Guardian Bldg., Cleveland, twenty-three 1 and 1½ story, brick, frame houses, W. 210 St., own forces. **$275,000.**

Pa., Allentown—Sacred Heart Hospital, 336 N. 4 St., convalescent home bldg. **$250,000;** cancer institute bldg. **$250,000,** separate contracts. George E. Yundt, 16 S. 6 St., archt.

Pa., Butler—Center Realty Co., 226 W. Penn St., two 3 story, bsmnt., 33x130 ft., brick apartments, Main St., to George Schenck & Co., 413 W. Jefferson St. Est. **$250,000.** Philip Friedman, 121 S. Negley St., Pittsburgh, archt.

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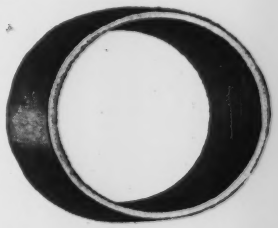

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COMMERCIAL BLDGS. (Contracts Awarded. Cont'd.)

Pa., Greentree (near Pittsburgh) — Marie Realty, Inc., 2422 Saw Mill Run Blvd., Pittsburgh, seventy-two 1½ story, bsmnt brick veneer apartments, 4 two story, bsmnt, concrete block, brick apartments, Greentree Rd. Owner builds. **$850,000.**

●**Pa., N. Versailles Twp (near McKeesport)**—Penn Pitt Constr. Co., 1108 Olivia St., Pittsburgh, four hundred 1½ story, bsmnt, brick veneer houses. Owner builds. **$4,200,000.** J. J. Cravotta, 1100 Olivia St., Pittsburgh, archt.

Tex., Abilene—Hendrick Memorial Hospital, Abilene, general contract 6 story, brick, stone, steel memorial hospital addn., to Rose Constr. Co., Abilene. **$348,000.** CD 4/10/46—ENR 5/2/46.

Tex., Houston — C. B. Archer & Assoc., (Archer Homes Inc.,) 1002 Humble Rd., 150 frame residences, rein.-con. slab fdn. Owner builds. **$750,000.** CD 12/24/46—ENR 1/2/47, under LB.

Tex., Waco—Southwestern Bell Telephone Co., Waco, masonry telephone bldg., concrete pier and beam fdn., to Robert E. McKee, 2708 Inwood St., Dallas. **$275,000.** CD 10/15—ENR 10/23.

Va., Norfolk—Kingsley Lane Apartments, c/o Lublin McGaughey & Assoc., archts., Taylor Bldg., 32 apartment units. Owner builds. **$300,000.** (Correction—location of project). CD 12/12—ENR 12/18, under Virginia.

Wash., Seattle—F. R. McAbee, 921 Elliott Ave. W., 88 unit frame apartments, north of Market St., day labor. **$700,000.** G. W. Stoddard & Assoc., Orpheum Bldg., Zone 1, archts.

Wash., Seattle—Ridgecrest Homes, Inc., Old Times Bldg., Zone 1, 32 houses in Ridgecrest Homes, day labor. **$336,000.**

Wis., West Allis—Sisters of Charity of St. Joan Antide, 6700 W. Belort Rd., Zone 14, 3 story, 155x205 ft. and 41x96 ft. steel, rein.-con. Home for Aged, concrete fdn., to H. Schmitt & Son, 930 E. Burleigh St., Milwaukee, Zone 12. Est. **$300,000.** Brust & Brust, 135 W. Wells St., Milwaukee, Zone 3, archts.

Ont., London—C. T. Sears, 383 Richmond St., 30 unit frame, brick veneer housing, 5th Concession, own forces. Approx. **$250,000.**

INDUSTRIAL BUILDINGS

BIDS ASKED

S. C., Aiken—BOTTLING PLANT—Lafaye, Lafaye & Fair, archts., W. F. Petty, Assoc., 1226 Sumter St., Columbia, bottling plant for Aiken Coca Cola Bottling Co., Aiken.

Tenn., Nashville — WAREHOUSE, etc. — Jacobs Packing Co., c/o Donald W. Southgate, archt., American Trust Bldg., warehouse and garage. Over $68,000.

Bids Asked January 5

●**Calif., San Jose**—PLANT—General Electric Co., 230 Montgomery St., San Francisco, 2 story, rein.-con. motor plant (general constr.). $1,400,000. Leland S. Rosener, 233 Sansome St., San Francisco, engr.

Bids Asked January 6

Calif., Hayward — WAREHOUSE — Hunt's Foods, Inc., W. A St., 150,000 sq. ft. floor space warehouse addn. Over $68,000.

Bids Asked January 7

O., Akron—BUS TERMINAL—Central Greyhound Lines, 2600 Hamilton Ave., Cleveland, 2 story, brick, limestone bus terminal, incl. regular depot facilities, restaurant, locker room, loading dock, offices, etc., Broadway. $500,000. W. S. Arrasmith, 1720 Euclid Ave., Cleveland, archt. CD 6/5—ENR 6/26.

Bids Asked

O., Cleveland—DIE SHOP, etc.—Precision Castings Co., 12600 Berea Rd., 1 story, 55 x 100 ft. and 2 story, 90 x 200 ft., brick, steel, concrete die shop and office addn. to castings plant. $150,000. Edward G. Hoefler, 5005 Euclid Ave., engr. CD 10/15—ENR 11/6.

SOON LETS CONTRACT

Ala., Florence—PLANT—Coca-Cola Bottling Co., Court St., soon lets contract bottling plant addn. Over $68,000. Plans deposit $10. T. R. Turner, Medical Arts Bldg., archt.

Conn., Bridgeport—PLANT—Swan Engraving Co., 22 Harrison St., soon lets contract 1 story, 80x150 ft., brick, steel plant, Hanover St. $70,000. Fletcher Thompson, Inc., 211 State St., engr.

Conn., Greenwich—SALES and SERVICE—Eastman Greenwich Motors, 379 Greenwich Ave., soon lets contract 1 story concrete, steel automobile sales and service, incl. machine shop, showroom, parts dpt., etc., W. Putman Ave. $70,000. O'Hara, Hedlander & Edson, 45 E. Putman Ave., archts.

Ga., Cordele — WAREHOUSE, etc. — The Cordele Builders Supply Co., Cordele, warehouse and office, to J. M. Page, Cordele. Est. over **$68,000.**

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Mo., Excelsior Springs — PLANT — Mineral Water Sys. of Excelsior Springs, E. L. Wilson, mgr., Excelsior Springs, soon lets contract, 1 story, 60x125 ft., concrete block, steel, bottling plant, Keene & Simpson, 1005 Land Bank Bldg., Kansas City, Mo., archts.

Mo., St. Louis — SHOP — Missouri Pacific R. R. Co., R. P. Hart, ch. engr., Missouri Pacific Bldg., 13 and Olive Sts., Zone 3, 1 story, 65 x 153 ft., steel, concrete repair shops addn., 3001 Chouteau Ave., own forces. **$101,400.**

N. Y., Tompkins Cove — GENERATING PLANT — Rockland Power & Light Co., 12 N. Broadway, Nyack, soon lets contract superstructure for generating plant. Burns & Roe, Inc., 233 Broadway, New York, Zone 7, engr.

Pa., Pittsburgh—SUPPLY HOUSE—Westinghouse Electric Corp., 575 6 Ave., soon lets contract brick, concrete, steel supply bldg., General Robinson St. $250,000. Hunting Larsen & Dunnells, Centry Bldg., archts. CD 4/28—ENR 5/15.

Tex., Houston—WAREHOUSE—Bettis Corp., 1507 Maury St., soon lets contract warehouse. $80,000. Addis Noonan Assoc., 803 American Hospital & Life Insurance Bldg., archts.

LOW BIDDERS

N. C., High Point—BUS STATION—Carolina Coach Co., 1201 S. Blount St., Raleigh, rejected bids Dec. 2, bus station. CD 11/20—ENR 11/27.

CONTRACTS AWARDED

Conn., Waterbury—PLANT—Berkshire Undergarment Co., 196 Mill St., 1 story, 125x155 ft., brick, steel, cinder block plant, Franklin St., to Shapiro Constr. Co., 108 Bank St. Est. **$70,000.** E. W. Cone, 111 Grand St., archt.

●**Idaho, Pocatello**—PLANT—Westvaco Chlorine Products Corp., 405 Lexington Ave., New York 17, N. Y., electric furnace plant, to United Engineers & Constructors, P. O. Box 628, Phila., Pa.

Ill., Chicago—FACTORY—Standard Process Corp., 734 Lexington St., general contract 163 x 198 ft., brick factory, to Enjay Constr. Co., 105 W. Madison St.; plumbing, to W. W. Watson Co., 758 N. Ogden Ave. Est. **$140,000.** L. P. Sumarkoff, 105 W. Madison St., archt.

Ill., Kankakee—FACTORY—Florence Stove Co., Kankakee, 1 story, 130x400 ft., brick factory addn., to Campbell-Lowrie-Lautermilch, 400 W. Madison Ave., Chicago. Olsen & Urbain, 5 S. Wabash St., Chicago, archts.

INDUSTRIAL BLDGS. (Contracts Awarded Cont'd.)

Ind., Fort Wayne—MILL—Allied Mills, Inc., 619 Davis St., 7 story, 60 x 180 ft., masonry, concrete, steel feed mill, to James Stewart Corp., 231 S. LaSalle St., Chicago, Ill. **$326,000.** Awarded 12/10. R. H. Maveety, 53 W. Jackson Blvd., engr.

Ia., Clinton — PLANTS — Chicago & North Western R. R., E. C. Vandenburgh, ch. engr., 400 W. Madison St., Chicago, Ill., locomotive, coaling and sanding plants, to Ogle Constr. Co., 38 E. Jackson Blvd., Chicago, Ill. **$91,830.**

Mo., Joplin—PLANT—H. & H. Mfg. Co., 830 Joplin St., 1 story, 100x150 ft., concrete block, brick plant, concrete fdns., on 3 acre site, between 13 and 17 Sts. east of Maiden Lane, to Ozark Constr. Co., Joplin. **$70,000** incl. equip. A. J. Richardson, Miners Bank Bldg., archt.

Mo., St. Louis—LAUNDRY PLANT—Clean Coverall Supply Co., 1325 S. Seventh St., Zone 4, 2 story, 80x83 ft., 1 brick laundry plant addn., concrete fdns., to I. E. Millstone Constr. Co., 4343 Clayton Ave., Zone 10, C. Prokes, 4343 Clayton Ave., Zone 10, archt.

Mo., St. Louis — SALES and SERVICE — Lindburg Cadillac Co., 4100 Laclede Ave., Zone 8, 1 story, 70x207 ft., brick, automobile sales and service bldg. addn., Sarah St. and Laclede Ave., to Fruin-Colnon Contg. Co., 1706 Olive St., Zone 3. Est. **$70,000** incl. equip. H. K. Graf, 2825 Olive St., Zone 3, archt.

Mo., St. Louis—PLANT—St. Louis Die Casting Corp., 4528 Oleatha Ave., Zone 16, 1 story, 58x110 ft., brick warehouse addn., 4516-28 Oleatha Ave., to John Eggeman, 6530 Hancock St., Zone 9, Tarling & Siebke, 2807 N. Grand Blvd., St. Louis, Zone 7, archts.

Mo., Springfield—STORAGE and SALES—Fadler Produce Co., 301 W. Mill St., 1 story, bsmnt. produce storage and sales bldg., incl. offices, refrigeration facilities, inside loading dock, etc., Phelps and Washington Sts., to Chapman & Bramer, 328½ South Ave. Est. **$121,500.**

N. J., New Brunswick—PLANT—Triangle Conduit & Cable Corp., Jersey Ave., design and construction 1 story steel, brick cable mfg. plant addn., Jersey Ave., to Wigton-Abbott Corp., 1225 South Ave., Plainfield. Est. **$650,000.**

●**N. Y., Bayside** — LABORATORY — Sylvania Electric Products Co., Inc., 35-25 Bell Blvd., research laboratory, to John H. Eisele Bldg. Co., 18 E. 41 St., New York. Est. **$1,000,000.** Bids 8/20. CD 8/13—ENR 8/21.

N. Y., New York—FILM STORAGE, etc.—Emery Roth & Sons, archts., 18 E. 48 St., Zone 17, film storage and office, 630 W. 43 St., for Bonded Motion Pictures Properties, Inc., 1600 Broadway, Zone 19, separate contracts. **$150,000.** James Rudderman, 32 Union Square, engr. CD 9/18—ENR 10/2.

N. Y., New York—REPAIR SHOP—Unity Motors Corp., 275 Seventh Ave., automobile repair shop, 318-24 Tenth Ave., to Structural Builders, 857 Broadway, **$135,000.** Est. $100,-009 Awarded 11/28. CD 4/24—ENR 5/15.

N. C., Hickory—FACTORY—Century Furniture Mfg. Plant, Hickory, factory addn., to Hickory Constr. Co., Hickory. Est. about **$100,000.**

Pa., Kent — MINE SHAFT — Rochester & Pittsburgh Coal Co., Indiana, 12x25x12 ft. thick and 406 ft. deep concrete mine shaft, steel and wood stairway and penthouse to shelter elevator equip., to Williamson Shaft & Constr. Co., 137-10 St., Indiana. Est. **$120,000.** Fred Spramkle, c/o owner, engr.

Pa., West Homestead—PLANT—American Brake Shoe Co. (Southern Wheel Div.), Mahwah, N. J., revamping present bldg. and addn. of penthouse, approx. 20x140 ft., to Ragner Benson, Rice St., Chicago, Ill. Est. **$85,000.** CD 10/23—ENR 10/30.

Pa., Wilkinsburg — SALES and SERVICE GARAGE—B. & W. Motors Sales, Inc., Wilkinsburg, 1 story, 84x120 ft. steel beam, brick sales and service garage, Penn Ave., to Allegheny Bldg. & Supply Co., 9 and Bingham St., Pittsburgh. Est. **$95,000.** CD 11/28—ENR 12/4.

Tex., Amelia (Beaumont P.O.)—LABORATORY, etc.—Sun Oil Co., Beaumont, laboratory, shop and office bldg., to Austin Co., 2 Natl. Bank Bldg., Houston. **$300,000.** CD 12/11—ENR 12/18.

Tex., Beaumont—BAKERY—Taystee Baking Co., Beaumont, bakery addn., own forces. **$145,000.** CD 8/1—ENR 8/7, under LB.

Tex., Dallas—FACTORY, etc.—Fulton Bag &Cotton Mills, Fitzhugh and Gaisford Sts., 1 story, structural steel, masonry bag mfg. bldg. and warehouse, concrete pier and beam fdn., to O'Rourke Constr. Co., P.O. Box 5384. **$90,000.** CD 12/19/46—ENR 1/1/47.

Tex., Houston—BOTTLING PLANT—Canada Dry Ginger Ale, Inc., 3115 Polk St., bottling plant, to W. S. Bellows Constr. Co., 716 N. Everton St. **$181,000.** CD 12/15—ENR 12/25.

Tex., Tulia — PLANT — Swisher Creamery Inc., c/o H. Teubel, Tulia, creamery plant, own forces. Approx. **$68,000.**

Wash., Spokane—WAREHOUSE—Grinnell Co. of the Pacific, Elliott Ave. and Bay St., Seattle, 2 story, 140 x 210 ft., rein.-con. warehouse, to Gus J. Bouten Constr. Co., N. 216 Division St. Est. **$200,000.** Funk, Molander & Johnson, W. 1023 Riverside St., archts. CD 12/3—ENR 12/18.

Man., Gladstone — GRAIN ELEVATOR — Manitoba Pool Elevators, Wheat Pool Bldg., Winnipeg, elevator, repairing old elevator, own forces. Approx. **$125,000.**

●**Ont., Hamilton** — FACTORY — Proctor & Gamble Co. of Canada Ltd., Burlington St. E., two 4 story, bsmnt. factory bays, to W. H. Cooper Constr. Ltd., Medical Arts Bldg. Approx. **$1,500,000.** CD 1/24/46—ENR 1/31/46.

Ont., Ottawa — PLANT — Brading's Capital Brewery, 840 Wellington St., plant alterations, Wellington St., to Carter Constr. Co. Ltd., 419 Cherry St., Toronto. Approx. **$150,000.**

Ont., Ottawa — LABORATORY — National Research Council, Sussex St., repairing 4 story office-laboratory, Sussex St., near Green Island, to H. Dagenais, 186 St. Patrick St. approx. **$130,000.** CD 3/28—ENR 4/4/46.

Que., Montreal—PLANT—Magor Bldg. Co. Ltd., St. Alexander St., 10 story, steel, concrete, brick plant addn., to J. P. Cartier, 2 Bellechasse St. Est. **$200,000.** H. E. Greenspoon, 1434 W. St. Catherine St., archt.

Que., Montreal—PLANT—Montreal Lithographing Co. Ltd., 1685 Ontario St. E., plant exten., Ontario and Papineau Sts. to H. C. Johnston Co. Ltd., 1502 St. Catherine St. W. Approx. **$80,000.** Ross, Patterson, Townsend & Heughan, Dominion Square Bldg., archts.

Que., Montreal—FACTORY—Cortal Realties Corp., J. D. Kouri, prop., 4215 Iberville St., 2 story, bsmnt., 80 x 125 ft., steel, concrete block, brick factory, concrete fdns., Iberville St., to Louis Donolo, Inc., 85 Jean Talon St. W., Montreal. Approx. **$125,000.** Luke, Little & Mace, 1410 Guy St., archts.

Que., Montreal—MILK DEPOT—Montreal Milk Producers' Assn., 748 St. Paul St. W., 3 story, 50x88 ft., steel, brick, block milk depot, concrete fdns., 1887 Notre Dame St. W., to Foss Constr. Co., Ltd., 660 St. Catherine St. W. Approx. **$78,000.** Lawson & Little, 660 St. Catherine St. W., archts.

Que., Quebec City — FACTORY — Imperial Tobacco Co. of Canada Ltd., 3810 St. Antoine St., Montreal, factory alterations, former St. Malo Shops, toolroom bldg., to Anglin, Norcross, Quebec Ltd., 892 Sherbrooke St. W., Montreal. Approx. **$125,000.** W. A. Jones, c/o owner, engr.

Que., Sherbrooke—DAIRY—Sherbrooke Pure Milk Co. Ltd., K. A. Bryce, secy., 77 Belvidere St. W., rein.-con., brick, tile dairy, to R. E. Stewart Constr. Co., P.O. Box 712, 266 Wellington St. S. Approx. **$65,000.** A. Belanger, 128 Queen St., archt.

UNCLASSIFIED

BIDS ASKED

Bids Asked January 5

Alabama—RURAL DISTRIBUTION LINES—Southern Pine Electric Co-operative, Brewton, labor only 200.79 mi. rural distr. lines, Escambia Co., etc. Plans deposit $25. CD 5/2—ENR 5/16.

Calif., San Jose—SWIMMING POOL—San Jose Bd. Educ., Auzerais and Almaden Aves., swimming pool at Abraham Lincoln High School. Over $50,000. Plans deposit $25. Binder & Curtis, W. San Carlos St., Ralph Wyckoff, Santa Clara and Marker Sts., and E. W. Kress Associated, 515 First National Bank Bldg., archts.

†**N. C., Camp Lejeune**—POWERLINE and LIGHTS—Pub. Wks. Office, Bldg. 1005, Marine Barracks, transmission powerline and certain lighting facilities at Tank Battalion Area, Marine Barracks, Spec. 19126. Plans deposit $25.

†**Md., Baltimore** — PIER IMPRVS. — U. S. Eng., 308 Customhouse, Wilmington, N. C., 3 timber camels for use at Hawkins Point Pier, Curtis Bay, Serial No. W-31-075-eng-48-34.

Bids Asked January 6

†**Md., Beltsville**—COAL YARD, etc.—Div. Purchases, Sales & Traffic, Agriculture Dpt., Independent Ave. between 12 and 14 Sts. SW, Wash., D. C., coal yard exten., and crane runways, Inv. 313-48.

Bids Asked January 7

B. C., Beaver Point — WHARF — Dpt. P. Wks., Hunter Bldg., Ottawa, Ont., repairing wharf, Beaver Point and Burgoyne Bay, and float renewal at Vesuvius Bay. Approx. $37,000. R. Blais, c/o owner, engr.

Bids Asked January 8

†**Conn., New London**—SPRINKLER SYS.—P. Wks. Officer, U. S. Naval Submarine Base, New London, automatic sprinkler sys. for Bldgs. 24, 25 and 26 at U. S. Naval Underwater Sound Laboratory, Fort Trumbull, New London, Spec. 19142. Plans deposit $10.

Bids Asked January 14

Calif., Los Banos—SWIMMING POOL, etc.—West Side Union High School Dist., Los Banos, swimming pool and recreational area at high school. Over $50,000. Plans deposit $10 David H. Horn & Marshall D. Mortland, 1244 O St., Fresno, archts.

Bids Asked January 15

Calif., Anaheim—TRAFFIC SIGNAL SYS.—State Div. Hy., State Bldg., Los Angeles, furnish, install fixed time traffic signal sys. at 11 intersections and modify existing hy. lighting at 9 intersections, modify fixed time sys. at 1 intersection, Los Angeles and Center Sts. G. T. McCoy, Sacramento, state engr.

Bids Asked January 16

†**N. M., Roswell**—BLEACHERS, etc.—U. S. Eng., Albuquerque, 2,000 seating capacity bleachers, baseball field; night lighting sys., grading, leveling, etc. $40,000.

LOW BIDDERS

La., Shreveport—SWIMMING POOL—City, Dec. 9, renovating swimming pool and recreation center, from Southern Builders, Inc., Hunter Bldg. **$99,367.**

New Hampshire — AERIAL SKI CHAIR TRAMWAY—State Hy. Dpt., Concord, Dec. 12, 3,000 ft. lift, aerial ski chair tramway, on Mt. Sunapee, Newbury, from John A. Roebling Sons Co., 51 Sleeper St., Boston, Mass. **$160,400.** CD 12/1—ENR 12/4.

New York—PUMPING STATIONS—Dpt. P. Wks., Charles H. Sells, supt., Albany, Dec. 17, pumping station, Cross Bronx Expressway-179 St., Contr. 2A, New York Co., from Del-Balso Contg. Corp., 100 Columbia Heights, Brooklyn, **$283,500,** est. $285,000; pumping equip. pumping station, Contr. 2D, New York Co., from Turbine Equipment Co., 75 West St., New York, **$516,351,** est. $550,000. Received no bids Dec. 17, plumbing facilities, pumping station, Contr. 2B, New York Co., **$11,000.**

N. Y., New York—SUBWAY YARD FACILITIES—Bd. Transportation, 250 Hudson St., New York, Zone 13, general contract altering structures to provide addnl. facilities at 239 Street Yard, from Colmar Constr. Co., 364 Gold St., Brooklyn, **$65,739;** plumbing, from Astrove Plumbing & Heating Corp., 213 E. 27 St., New York, **$82,875.** CD 11/24—ENR 11/27.

●**Tex., Austin**—STADIUM—Bd. Regents University of Texas, Dec. 16, enlarging concrete Memorial Stadium, from R. P. Farnsworth, P. O. Box 74, Houston. **$1,415,000.** CD 11/24—ENR 11/27.

†**Washington**—TRANSMISSION LINE—Bonneville Power Admin., 729 N.E. Oregon St., Portland, Ore., rejected bids Oct. 27, clearing right-of-way for Olympia-Cosmopolis transmission line. L.B. **$417,965.** Will re-advertise. CD 11/7—ENR 11/13, under L.B.

Washington — RURAL DISTRIBUTION LINES—Public Utility Dist. 1, Goldendale, rejected bids Nov. 12, 370 mi. electrical transmission and rural distr. lines. L.B. **$301,396.** Will re-advertise. CD 11/18—ENR 11/20, under L.B.

British Columbia — FISHWAYS — International Salmon & Fisheries Comn., Dominion Bldg., New Westminster, cancelled bids to have been opened Dec. 15, fishways construction on right bank low level and left bank high level at Hill's Gate, Fraser River. **$200,000.** M. Bell, Dominion Bldg., New Westminster, engr. CD 12/2—ENR 12/4.

CONTRACTS AWARDED

Arkansas—RURAL DISTRIBUTION LINES—C & L Rural Electric Co-operative Corp., Lynn Thomasson, mgr., Star City, Ia., 185 mi. single-phase and 12 mi. 3-phase rural distr. lines in Cleveland, Lincoln, Jefferson, Grant, Bradley, Drew, and Desha Counties, and substation in Lincoln Co., own forces, under supervision Chanaberry Eng. Co., engrs., Louisville, Ill. **$250,000.** CD 10/9—ENR 30.

Ark., Little Rock—STADIUM—State War Memorial Stadium, c/o Keith, Magnolia, memorial stadium, to Harmon Constr. Co., 1128 N. W. 4 St., Oklahoma City, Okla. **$960,021.** Bids 12/15. CD 10/30—ENR 11/6.

Ky., Nicholasville—ELECTRIC DISTRIBUTION SYSTEM—City, repairing electric distr. sys., to Shely Constr. Co., 809 Manchester St., Lexington. **$123,000.**

Mississippi — RURAL DISTRIBUTION LINES—Monroe Co. Electric Power Assn., Amory, 130 mi. rural distr. lines, Monroe Co., to Neely Bros. Constr. Co., Hollandale, labor **$37,024,** materials, **$130,000.** Total $167,024. Bowman & Bowman, Greenswood, engrs. CD 9/28—ENR 10/11/46

South Dakota — RURAL DISTRIBUTION LINES — Hutchinson Electric Assn., Freeman, labor for 181 mi. rural distr. lines, Hutchinson Co., to George B. Determan, Melrose, Minn. Approx. **$50,000.** Buell & Winter, 508 Insurance Exchange Bldg., Sioux City, Ia., engrs.

Wash., Seattle—PIER REMODELING, etc.—Great Northern R. R. Co., H. J. Seyton, ch. engr., 175 E. 4 St., St. Paul, Minn., remodeling Pier 88, constructing steel warehouse on pile concrete capped fdns., 2 story rein.-con. office bldg. on pile footings, to Atherton Constr. Co., Terminal Sales Bldg., Zone 1. Over **$750,000.** J. W. Hayes, c/o owner, ch. archt.

Proposal Advertisements see pp. 122 & 143
Proposed Projects see p. 105

OFFICIAL PROPOSALS

CORPS OF ENGINEERS, Baltimore District, Baltimore, Md.—Sealed bids will be received here until 11:00 a.m., 2 February 1948, and then opened for furnishing plant, labor and materials for Construction of Hospital for Veterans Administration, Wilkes-Barre, Pennsylvania. Plans may be obtained by a deposit of $50.00 per set in the form of cash, CERTIFIED CHECK or postal money order payable to The Treasurer of the United States and mailed to the District Engineer, Baltimore District, Corps of Engineers, 24th Street and Maryland Avenue, P. O. Box 1715, Baltimore 3, Maryland. (105)

BIDS FOR MECHANICAL WORK, VETERANS HOSPITAL, SHREVEPORT, LOUISIANA.—NEW ORLEANS DISTRICT, CORPS OF ENGINEERS, FOOT OF PRYTANIA STREET, NEW ORLEANS, LOUISIANA.—SEALED BIDS will be received in this office until 11:00 a.m. CST, 30 December 1947, and then publicly opened, for furnishing all plant, labor, materials, and equipment necessary for the complete installation of all mechanical work in the Veterans Administration Hospital, Shreveport, Louisiana, 450 Bed G.M., Project No. 2456. The work includes installation of plumbing; a boiler plant; heating, ventilating and air conditioning; refrigerating systems and cold storage rooms; horizontal, centrifugal, water pumps; pneumatic tube system; automatic sprinkler systems; and sterilizing equipment. Plans and specifications for the mechanical work is included in plans and specifications for the hospital and may be obtained from this office on deposit of $150.00. (929)

Bids: January 14, 1948 (111)

Concrete Widening and Bituminous Resurface, 10.245 Mi.

Sealed proposals will be received by the State Highway Department at its offices, Dover, Delaware, until 2:00 P. M., E.S.T., Jaunary 14, 1948, and at that time and place publicly opened for a contract involving the following approximate quantities:

CONTRACT 845
Federal Aid Project FA-F-66 (3)
Dagsboro to Georgetown
Sussex County

24	A. Clearing
21	A. Grubbing
25,000	C.Y. Excavation
800	C.Y. Structure Excavation
1,250	C.Y. Borrow
800	C.Y. Borrow Pit Stripping
15,000	C.Y. Selected Borrow
3,600	C.Y. Cement Concrete Base
30,000	T. Hot Mix Asphalt Surface
1,400	S.Y. Patching
580	C.Y. Cement Concrete Masonry
45,000	Lb. Reinforcing Steel
1,650	L.F. 12" R.C. Pipe
900	L.F. 15" R.C. Pipe
210	L.F. 18" R.C. Pipe
1,410	L.F. 12" Concrete Sewer Pipe
2,810	L.F. 18" Concrete Sewer Pipe
600	L.F. 8" Corr. Metal Pipe
1,100	L.F. Timber Piles
19	Ea. Catch Basins
9,000	Lb. Castings
600	C.Y. Topsoil
0.75	A. Seeding
6,700	L.F. Reset Guard Rail
6,700	L.F. Wood Shoulder Curb
725	Ea. Guard Rail Posts
1,000	C.Y. Ditch Excavation
70	Ea. Removal of Trees
670	T. Sand

This contract is a Federal Aid Project and will come under the provisions of the Federal Aid Highway Act as amended.

The Employment Agency for this contract shall be the Delaware State Employment Service offices, Wagamon Building, The Circle, Georgetown, Delaware.

Attention is called to the Special Provisions in the proposal, specifications and contract agreement.

Performance of contract shall commence within ten (10) days after execution of the contract and be completed as specified.

Monthly payments will be made for ninety (90) per cent of the construction completed each month.

Bidders must submit proposals upon forms provided by the Department.

Each proposal must be accompanied by a surety bond, certified check, or money to the amount of at least ten (10) per centum of the total amount of the proposal.

The envelope containing the proposal must be marked "Proposal for the construction of State Highway Contract No. 845.

The contract will be awarded or rejected within twenty (20) days from the date of opening proposals.

The right is reserved to reject any or all bids.

Complete sets of plans and specifications may be obtained after January 1, 1948, upon receipt of Five dollars ($5.00) for each contract, which amount will not be refunded.

Make checks payable to the State Highway Department.

STATE HIGHWAY DEPARTMENT
By: F. V. duPont, Chairman
W. A. McWilliams, Chief Engineer.
Dover, Delaware

Bids: January 5, 1948 (112)

Borings

THE PORT OF NEW YORK AUTHORITY
UNION BUS TERMINAL
CONTRACT BT-1

Sealed proposals for borings on the site of the proposed Port Authority Union Bus Terminal and its approaches from the Lincoln Tunnel, Borough of Manhattan, New York City, will be received at the office of the Chief Engineer of The Port of New York Authority, Room 1539, 111 Eighth Avenue, New York 11, N. Y., until 2:30 o'clock on the afternoon of Monday, January 5, 1948, and thereafter in the Auditorium of the Authority at the same address until 3:00 P.M., on the same date, at which latter time and place said proposals will be publicly opened and read.

Contract documents may be seen at the office of the Chief Engineer, The Port of New York Authority, Room 1539, 111 Eighth Avenue, New York City, and copies will be furnished upon deposit of $10.00 per set. The deposit will be remitted if the documents are returned in good condition, not later than thirty days after the opening of proposals.

THE PORT OF NEW YORK AUTHORITY
Howard S. Cullman,
Chairman.
New York, December 26, 1947.

Bids: January 19, 1948 (997)

Sewage and Garbage Treatment Plant

Sealed proposals will be received by the City Clerk of Port Huron, Michigan at his office in the City Hall up to 2:00 o'clock P. M., E. S. T. of January 19, 1948 for constructing the sewage and garbage treatment plant and erecting the major items of equipment which are to be purchased by the Owner under separate contract.

The drawings and specifications under which the work is to be done are on file and may be examined at the office of the City Engineer, City Hall, Port Huron, Michigan or at the offices of Sheecraft, Drury and McNamee, Consulting Engineers, Ann Arbor, Michigan and copies thereof may be obtained from the latter by making a deposit of Twenty-five Dollars ($25.00) per set. The full amount of deposit will be refunded to bidder for each set of documents upon which a bona fide proposal is submitted. For others Twenty Dollars ($20.00) will be refunded for each set returned in good condition and within ten (10) days after the bidding date.

A certified check or bidder's bond for a sum not less than five per cent (5%) of the amount of the proposal will be required with each proposal.

The right is reserved by the Owner to accept any proposal, to reject any proposal and to waive irregularities in proposals.

CITY OF PORT HURON, MICHIGAN
Allen R. Hill
City Clerk

Bids: January 8, 1948 (991)

Elevator

Invitation No. 48-7 December 3, 1947
Subject:
NOTICE OF ADVERTISING FOR BIDS FOR THE INSTALLATION OF AN ELECTRIC OIL-HYDRAULIC ELEVATOR IN FILTRATION PLANT, BUILDING NO. 1406, OAK RIDGE, TENNESSEE.
To: Prospective Bidders and Others Concerned:

1. On December 5, 1947, Roane-Anderson Company, operating as Agent, under CPFF Contract No. W-7401-eng-115, with the Government of the United States, will issue invitations for bids for the furnishing and installing of an Electric Oil-Hydraulic Elevator in Filtration Plant, Building No. 1406, Oak Ridge, Tennessee.
2. The work consists of furnishing all plant, labor, materials and equipment, and performing all work (except work specified to be performed by the Agent) required to complete the installation of an electric Oil-Hydraulic Elevator. The car platform shall be approximately 5' 10½" x 5' 9½", with a minimum live load of 4000 pounds, exclusive of the weight of the complete car, at an average speed of 22 FPM with electric power supply of 220/440 volts, 60 cycle, 3-phase alternating current. Travel of car is from first to second floor, stopping at two landings and serving two openings, a total distance of 12 feet 4½ inches. Incidental work includes drilling for jack unit in earth, shale or rock as required. Electrical service to machine room will be provided by the Agent (Roane-Anderson Company).
3. Bids will be received until 2:00 p. m. (EST), January 8, 1948, and then publicly opened. Seventy-five (75) calendar days will be allowed for the completion of the work.
4. Request for plans and specifications should be made to Roane-Anderson Company, Attention: Purchasing Department, Section F. F., P. O. Box 456, Oak Ridge, Tennessee. No deposit will be required.
5. For additional information address the above mentioned, or telephone Knoxville 2-7132, extension 4850, or Oak Ridge 5861, extension 4850.

ROANE-ANDERSON COMPANY

Bids: January 27, 1948 (113)

Pumps, Electric Motors, Etc.

CONTRACT 363

SEALED BIDS will be received by the Board of Water Supply, at its offices, thirteenth floor, 120 Wall Street, New York City, until 11:00 A. M., Eastern Standard Time, on Tuesday, January 27, 1948, for Contract 363, for furnishing, testing and delivering two deep well pumps rated 600 gallons per minute at 710 feet total head and seventeen other pumps of smaller capacities, with electric motors and appurtenances, for chambers of the Delaware aqueduct, all as set forth in the specifications.

No bid will be received and deposited unless accomapnied by a certified check upon a National or State bank, drawn and made payable to the order of the Comptroller of the City of New York, in the amount of six thousand dollars ($6,000.00), for the proper execution of the contract.

At the above place and time the bids will be publicly opened and read. Pamphlets containing information for bidders, forms of bid and contract, specifications, contract drawings, requirements as to surety, etc. can be obtained at the office of the Chief Engineer, Room 1312, at the above address, upon application in person or by mail, by depositing the sum of five dollars ($5.00) in cash or its equivalent for each pamphlet. Within 30 days following the award of contract or rejection of bids, the full amount of such deposit will be refunded for each pamphlet submitted as a bid and a refund of four dollars ($4.00) will be made for each other pamphlet returned in acceptable condition. Arrangements will be made whereby prospective bidders desiring blueprints of the contract drawings for their own use may secure same, the cost thereof to be paid by them. For further particulars, apply at the office of the Chief Engineer at the above address.

IRVING V. A. HUIE, President, HENRY HESTERBERG, RUFUS E. McGAHEN, Commissioners, Board of Water Supply; RICHARD H. BURKE, Secretary.

(Continued on page 143)

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

EXECUTIVES EXCLUSIVELY

SALES MANAGER—$25,000—Under 50. National experience. Client is lamp manufacturer.

ASSISTANT TO SALES MANAGER—$18,000—Under 45. B.A. Degree. Co. in non-ferrous manufacturing field. Executive type only, capable becoming Gen. Mgr. within 5 years.

FIELD SALES MANAGER—$15,000—Under 40. Able supervise large field force. Knowledge distribution brass, copper and aluminum.

SALES MANAGER—$10,000-$15,000—Under 45. Lumber Co. Should have experience selling to railroads, utilities and construction Co's.

BRANCH SALES MGR.—$7500-$10,000 — Know basic paint oils or industrial paints. Rush!

DIVISIONAL SALES MGR.—$7500 plus bonus—Under 40. M.E. Degree. Knowledge building material field and sales through distributors.

SALES PROMOTION EXECUTIVE—$12,000—Under 40. Experience and knowledge sales through hardware jobbers, sporting goods distributors, large chain stores.

SUPERINTENDENT — $10,000-$15,000 — Man should be experienced in locomotives, steam, large printing press, or heavy tool construction. Works manager type.

PRODUCTION MANAGER — $10,000-$15,000 — Under 42, M.E. Graduate, machine shop experience in Techniques of separating metal from metal, grinding, boring, planing, executive interested manufacturing end more than engineering end. Do not want production control experience. Location: New England.

BRANCH MANAGER—$7200 plus Bonus—Complete charge steel warehouse and sales.

LEONARD EXECUTIVE PERSONNEL

Club Floor, Hotel Wm. Penn, Pittsburgh 19, Pa.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

CIVIL SERVICE

ENGINEERS—EXPERIENCED and inexperienced, civil, mechanical or electrical, wanted for permanent and temporary positions under civil service in Highway, Conservation, Building and Construction and Public Service Departments. Salaries from $280-$475 per month. Write Michigan Civil Service Commission, Lansing, Michigan.

POSITIONS VACANT

WANTED—ENGINEERS, Architects, Draftsmen, experienced in the design of sewers, sewage treatment plants, water treatment plants and industrial buildings. Also engineers to supervise construction. State qualifications, experience, salary requirements and date available. P-1155, Engineering News-Record.

TECHNICAL GRADUATES (especially chemical, electrical and mechanical) under 35, have excellent opportunity for permanent position with nation wide engineering organization. After training period, work will include traveling for consultation among leading industrial plants. P-3046, Engineering News-Record.

ESTIMATOR — EXPERIENCED in Roads, Bridges and Sewers, etc., wanted by established Phila. company. State experience and salary expected. P-3178, Engineering News-Record.

GENERAL SUPERINTENDENT—Wanted by Phila. concern for highways, bridges and sewers. Give experience and expected salary. P-3179, Engineering News-Record.

GENERAL SEWER Foreman — Wanted for various types of Sewers in Phila. wet, rock and tunnel excavation. State experience and salary. P-3180, Engineering News-Record.

DRAFTSMEN, QUALIFIED to detail steel or concrete structures in connection with industrial and power plant design. Office located in downtown Philadelphia. State experience and availability. P-3210, Engineering News-Record.

DESIGNERS, FOR industrial and power plant work. Experienced men in either steel or concrete desired. Office located in downtown Philadelphia. State experience and availability. P-3209, Engineering News-Record.

WANTED ESTIMATOR and Draftsman—experienced civil or architectural graduate. Permanent position long established construction company location Ohio Valley. State age, education, and starting salary in first letter. Reply Box 830, Wheeling, West Virginia.

WANTED

ROAD BUILDING SUPERINTENDENT

Full time to supervise all types of pavement installations for long established, financially responsible, Northern New Jersey corporation. Must have actual field experience to qualify. Reply in writing stating age, education, experience, residence, marital status, availability, and salary expected. Include photograph and references.

P-3412, Engineering News-Record
330 West 42nd Street, New York 18, N. Y.

WANTED

Experienced Detailers & Checkers

of reinforcing bars for various types of construction projects. Engineers preferred.

ROBBERSON STEEL COMPANY
P. O. Box 1675 Oklahoma City, Okla.

COAL STRIPPING SUPT.

WANTED IMMEDIATELY

Large contracting firm requires capable superintendent for Pennsylvania operation. Complete details and salary desired first letter. All replies confidential.

P-3414, Engineering News-Record
330 West 42nd Street, New York 18, N. Y.

POSITIONS VACANT

NEW ENGLAND college for men has opening in Civil Engineering second semester. Assistant professor at $2600-$2800 (masters degree or equivalent experience or associate professor at $3200-$3400 (masters degree plus considerable experience). Surveying, mechanics, strength of materials, water supply, and sanitary engineering. P-3256, Engineering News-Record.

CIVIL ENGINEER for steel fabricating shop, permanent position with unusual opportunity for advancement in small organization. Apply Tippett & Wood, Philipsburg, N. J.

DESIGNING ENGINEERS for sewage treatment plants, sewers, waterworks. Give detailed qualifications, salary requirements and availability. New York City Consulting Engineer's Office. P-3332, Engineering News-Record.

GRADUATE CIVIL Engineer wanted for promotional work in southern New England. Must have at least 10 years' construction experience, preferably in public works. Permanent position with National organization. In reply please give complete history of education and experience. P-3365, Engineering News-Record.

WANTED: CONSTRUCTION superintendent experienced in fine architectural building construction for two year job in Central Illinois. Excellent opportunity for qualified man for permanent connection. P-3400, Engineering News-Record.

WANTED—BRIDGE designer to take charge of small organization in Consulting Engineer's office. State experience, salary desired and date available. P-3397, Engineering News-Record.

WANTED: ASSISTANT Professor of Structural Engineering. A man with practical experience in structural engineering field and with some teaching experience is desired, but those lacking teaching experience are also invited to apply. Salary $3,300-$3,800. Write, stating qualifications, to the Dean of Engineering, Fenn College, Cleveland, 15, Ohio.

FOREMAN CAPABLE of supervising, repairing and maintaining all kinds contractor's equipment, including trucks. Permanent job at fixed location for party who can qualify. Only party having previous experience in handling repair and maintenance of contractor's equipment will be considered. Apply in own handwriting, stating age, reference, when available and salary expected. P-3409, Engineering News-Record.

Salaried Positions $2,500 $25,000

This thorough organized confidential service of 37 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC. 272 Dun Bldg., Buffalo 2, N. Y.

POSITIONS VACANT

INSTRUCTOR OR Assistant Professor of Civil Engineering and Mechanics. Position available March 1, 1948. Location New York State. Give experience, references and salary expected. P-3283, Engineering News-Record.

EMPLOYMENT AGENCY

WANTED—ENGINEERS—Designers—Draftsmen—Chemists — Architects — Shop Executives—Project Engineers—Engineering Teachers. Cleveland Engineering Agency, 2132 East Ninth, Cleveland, Ohio.

POSITIONS WANTED

CONSTRUCTION MANAGER—General Superintendent Mechanical Civil Engineer, 45. Native American, 25 years diversified, progressive domestic and foreign experience field engineering construction supervision, proven management business ability including extensive costs and mechanical. Erection Major companies—atomic energy, refining, power, heavy and light chemicals, rayon, sugar mass-housing, bldgs., utilities, concrete, docks, heavy earthwork including important government jobs proven performance records costs, time earnings. Dependable, good health, references, speak Spanish, Portuguese, German, some French, available immediately. Interested Latin America, Europe, Africa or Domestic. PW-3265, Engineering News-Record.

CONSTRUCTION MANAGER with real executive ability and 25 years experience in all phases of building construction operations desires position carrying full responsibility of office and field operations. Available Jan. 1st, 1948. PW-3183, Engineering News-Record.

RECENT C.E. graduate. Three years Army Engineers, Pacific. Varied experience in small consulting engineer office. Location optional. PW-3329, Engineering News-Record.

CONSTRUCTION MANAGER or General Superintendent. Many years diversified experience in construction. Have handled large joint venture projects both foreign and domestic. Correspondence invited. Location immaterial. Address PW-3315, Engineering News-Record.

CIVIL ENGINEER, February 1948 Cornell graduate, veteran, age 26, married, no children. Wants employment with contractor with opportunity to learn field and office procedure. R. F. Green, 218 Linn Street, Ithaca, New York.

CONSTRUCTION EXECUTIVE. Registered Professional Civil Engineer desires connection with contractor as manager or general superintendent. Age 45. 23 years experience in engineering and construction housing projects, industrial buildings, sewers, ship-yards, docks, roads, paving, drainage structures, heavy earth work, reinforced and mass concrete structures and foundations. Versed in procedure and requirements Government contracts and cost plus a fixed fee projects. Have good record in conducting harmonious relations necessary for productivity. Can accept responsibility, make decisions, organize office and field work, and obtain results. Write 52 Warren Road, Louisville 6, Kentucky.

CIVIL STRUCTURAL Engineer, university graduate, licensed N.Y. & N.J., over 20 years diversified experience in design and general contracting on structures of magnitude in U. S. and abroad, such as industrial plants, hydro-electric developments, bridges, etc., desires position as executive engineer with full responsibility. Salary $10,000.00 up plus bonus, and for abroad plus maintenance of self and wife. PW-3366, Engineering News-Record.

(Continued on page 125)

SUCCESSFUL SALESMAN

offers services to progressive concern manufacturing heavy construction equipment. Now employed but seeks opportunity with real future. Extensive prewar and postwar experience selling to industry. Age 29. Naval officer in war. College graduate, travel anywhere. Details on request.

P-3378, Engineering News-Record
330 W. 42nd Street., New York 18, N. Y.

Additional Positions Vacant Ads on page 124

CHIEF ENGINEER

Nationally known Consulting Engineering Firm specializing in the design of tunnels, highways, bridges, airports and harbor structures desires thoroughly experienced Chief Engineer.

Must be capable of supervising all phases of Engineering necessary for design and inspection of construction of large projects including Structural, Electrical, Mechanical, Hydraulic and Testing Laboratory.

Applicant must be energetic, able to work under pressure and have ability to make decisions. Position offers excellent future and salary with permanence to the right man. Residence on Gulf Coast.

Please submit a complete resume stating your experience (all details of supervisory positions including number of persons supervised), education, date available, and salary required.

All applications held in strict confidence.

P-3124, Engineering News-Record
520 North Michigan Ave., Chicago 11, Ill.

Experienced personnel wanted for Guam employment at good salaries:

PRINCIPAL ENGINEERS (Structural and Electrical Design)
SENIOR ENGINEERS (Structural Design)
CIVIL ENGINEERS (Paving, Roads & Streets Design)
SOILS AND MATERIALS Testing Engineer
SENIOR DRAFTSMEN (Structural, Architectural and Electrical)
INSTRUMENT MEN (Survey Parties)
FIELD SUPERVISOR (Construction - Structural)
BLUE PRINT MACHINE OPERATOR
INSPECTORS, CONCRETE BATCH PLANT

No families permitted. Quarters and subsistence to be furnished at cost not exceeding $1.50 per day. Employment Agreement for twelve months' period with travel expenses and salary paid to job site and return. Age limit 21 to 50 years. Physical examination required.

Furnish detailed narrative record of education and experience with previous salaries via air mail giving telephone number where applicant can be contacted to:

Robert & Company, Inc.
706 Bona Allen Building
Atlanta 3, Georgia

WANTED

STRUCTURAL ENGINEERS

New York Engineering organization specializing in design and construction of power plants and industrial structures desires to employ engineers thoroughly experienced in all phases of structural design, correlated with architectural design:—planning, assigning of work, writing of specifications, requisitioning of materials and placing of orders. Applicant should be at least 40 years old with about 15 years general field and office structural experience. Please submit resumes.

P-577, Engineering News-Record
330 West 42nd Street, New York 18, N. Y.

DESIGNERS

Wanted Engineers experienced in structural steel, concrete and electrical design. Steady employment with excellent working conditions, benefits and opportunities.

THE CLEVELAND ELECTRIC ILLUMINATING CO.
75 Public Square, Cleveland 1, Ohio

WANTED

ELECTRICAL ENGINEERS

Graduates, experienced in design, engineering and economic studies of steam-electric and hydro-electric power plants and high voltage substations. Also, engineer experienced in power system relaying and in preparation of specifications for switchboards and switchgear. Please submit resume including personal data, education and experience record to Personnel Department.

Ebasco Services Incorporated
Two Rector Street, New York 6, New York

WANTED

GRADUATE CIVIL ENGINEER

10 to 20 Years Experience
for
Roads, Railroads, Drainage and Foundation Design
All Replies Strictly Confidential
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FOR WORK IN ARIZONA AND NEW MEXICO

Experienced Superintendents and Foremen
High Pressure Boiler Erection
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P-3278, Engineering News-Record,
330 W. 42nd St., New York 18, N. Y.

ENGINEERS

Experienced in highway, road and bridge work. Designers, draftsmen, party chiefs, instrumentmen. Positions with private consulting engineering firm offering the usual opportunities for permanency to good men. Write full particulars to

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Wanted for Bridge Work
Rieth-Riley Construction Co.
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WANTED

Graduate Civil Engineers

under thirty, as field engineers in connection with Water Waste Surveys and Engineering Studies of municipal water distribution systems.

THE PITOMETER COMPANY, INC.
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Concrete and Steel
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WANTED

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To head contracting and engineering company's engineering staff in a foreign country. Engineering personnel numbers about 75. Must be capable of supervising preparation of reports, laying out construction program, estimating, budgeting, location and preliminary investigation, all phases of construction engineering, requisitioning material, and simple design. Design of any magnitude will be done in the U. S. Will report to Project Manager in field and to Chief Engineer in U. S.

Two-year contract to begin March, 1948. Salary $900.00 per month. All expenses paid.

Submit full record with photograph.

P-3391, Engineering News-Record
330 West 42nd Street, New York 18, N. Y.

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FOR OAK RIDGE TENNESSEE

Architectural and structural
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Electrical and mechanical
ENGINEERS
Housing available
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P. O. Box #385 Oakridge, Tenn.

WANTED

PROJECT MANAGER

To head contracting and engineering company's activities in a foreign country, with American personnel of about 200. Must be capable of managing engineering, construction work, accounting, and of dealing with high foreign officials. Must see that program is properly scheduled, estimated, budgeted, and performed. Will report to President of Company in U. S.

Two-year contract to begin between May and July, 1948. Salary $1,200.00 per month. All expenses paid.

Submit full record with photograph.

P-3390, Engineering News-Record
330 West 42nd Street, New York 18, N. Y.

WANTED

Experienced Detailers & Checkers

of structural steel for various types of construction projects. Engineers preferred.

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Capable checkers for shop drawings for Fabricating Shop

Top salaries for good men with experience. Position is permanent with good working conditions. Some over-time. State age, qualifications, salary, and how soon available.

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Syracuse, New York

CAPABLE ERECTION MANAGER

Prefer engineering graduate experienced in planning construction of all types steel buildings, bridges, capable making costs and handling erection crews. Excellent opportunity for permanent employment competent engineer.

P-3196, Engineering News-Record
520 North Michigan Ave., Chicago 11, Ill.

ASS'T CITY ENGINEER,
Civil Engineer Grade III — Salary $3125.00
TRANSITMAN
Civil Engineer Grade II
Salary $2375.00 to $2775.00
PERMANENT POSITIONS
Must qualify by Civil Service Examinations
Write COMMISSIONER OF PUBLIC WORKS
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Chestnut Hill 7-3807

POSITION WANTED
(Continued from page 123)

STRUCTURAL ENGINEER and quantity surveyor, N. Y. State L.P.E. Experience includes field and office work. Familiar with large and complicated projects. PW-3383, Engineering News-Record.

WORK WANTED

Accurate Ratioed Enlargements
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FOR RENT

Transits 17 Per Month, Levels $14
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before U. S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel. Registered Patent Attorneys, Suite 454, 815-15th Street, N. W., Washington 5, D. C.

WANTED

ANYTHING within reason that is wanted in the field served by Engineering News-Record can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

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Because of the Holiday, New Year's Day, January 1st, the "Searchlight" pages of the

January 8th Issue of

ENGINEERING NEWS-RECORD

Close for press earlier than the usual weekly closing time.

The cooperation of advertisers is solicited in forwarding new copy, or changes of copy, to reach us accordingly.

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Display and Undisplayed Ads
Tuesday, December 30th

PROPOSALS
Wednesday, December 31st

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Butler, 3 comp. 80 ton Aggr. bin.
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20 Mixers 10S, 14S, 21S, 40S, 56S.
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Derrick & Hoist 75 tons stiff-leg.
American Terry stiff-leg 50 tons 90' boom.
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CONVEYOR BELT (NEW): Large quantity 42" and 60", 6 and 7 ply, 7/16" top cover, 1/16" bottom cover, 42 oz. duck, all NEW, NATURAL RUBBER. Also, 500 ft. 36", 6 ply, 32 oz. duck. NEW.

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MINE HOISTS: 1—Double drum 1000 H.P.
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STEAM: 14x12, 9x10, 8½x10 & 7x10
ELECTRIC: 30, 40, 60, 80, 100, 125 & 150 H.P.
GAS & DIESEL: 15, 40, 75, 90, 110 & 140 H.P.

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25 Ton American Steam & 3—20 Ton Ohio
40 Ton Ohio, Steam
50 Ton Industrial Brownhoist, Steam

LOCOMOTIVES

33—Steam—40, 60, 110 & 220 ton
7—Diesel—14 & 20 ton, also 45 ton & 85 ton
44—Gasoline—4, 6, 8, 12, 16, 25 & 35 ton
100 Ton GE Diesel Electric
16 ton Vulcan Std. Ga. Gas

PAVERS—MIXERS

5—27E & 34E Dual Drum Pavers
16—¾, 1, 2 & 3 Yd. Mixers

PILE HAMMERS & EXTRACTORS

9—McKiernan-Terry No. 1, 3, 5, 6, 7, 9B3, 10B3
Vulcan 800 Extractor & Vulcan #2 & 1 Hammers
5 VULCAN 50c & 80c Hammers
Vulcan Model 5000 Super Hammers
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Model 160, 190 & 180 & 200 REX Pumpcretes

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140—Flat Cars 30-40, 50 ton
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126—8000 & 10000 gal. Tank Cars

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1 Yd. Osgood Crane & Backhoe
1 Yd. Thew 57 Elec. Tunnel
1¼ Yd. 41B Bucyrus Steam
1 Yd. Northwest Gas
2—4 Yd. Marion Elec.
2—44B-BE. Diesels
1½ Yd. 42B Shovel & Crane

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5 Ton Steel Stiff Leg 40 Ft. Boom
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One lot new half-yard clam buckets.
New Hydraulic dozers for D-2; D-4 and D-6.

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Caterpillar D-8 with dozer.
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Cap. 30 tons @ 38' radius.

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900 cu. ft. actual Chicago Pneu. 2-stage portable air compressor size 15¼ x 9 x 7", Mod. WO2, Ser. No. 30975, normal working pressure 100#, with intercooler. Powered by 4 cylinder Chicago Pneu. Type 49 DIESEL, engine 4 cycle complete with gasoline driven starting engine. All mtd. on 4 pneu. tired wheels.

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PORTABLE—Two Stage

5—315 cu. ft. Ingersoll Rand, power 4 cyl. Waukesha gasoline engines.
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1—210 cu. ft. Ingersoll Rand power 4 cyl. 60 H.P. Waukesha gasoline engine.
1—210 cu. ft. Worthington power 75 H.P. Hercules Gasoline engine.
1—210 cu. ft. Sullivan Class WK60 power 4 cyl. Buda gasoline engine.
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We also have a large stock of portable single stage compressors from 110-320 cu. ft. displ.

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½ yd. Universal crane, #873, with 25' boom, powered by 4 cyl. Mdl. ER-10, Wauk. gas engine, all mtd. on Hendrickson 10 wheel pneu. tired truck, tandem drive.

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1—18 ton O & S type B Crane, mtd. on 8 ft. 0 in. ga. truck, 50 ft. boom. Power 52 H.P. 440-60-3 electric Mtr.

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1—1 yd. Byers Master Model Crawler Crane, Ser. No. 3596. With 40' lattice type boom, tagline and fairleads for dragline work. Powered with 4 cyl. 100 HP Mod. TXO Hercules gasoline engine.
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All this equipment is owned by us and may be inspected at one of our plants

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STIFF LEG DERRICKS

1—62½ Ton Insley, 54' boom, 70' mast.
22—30 Ton BRAND NEW Wiley derricks, 60' booms, 32' masts.
6—4 Ton Ingram, 23'-8" masts, 50' booms with 27 H.P. Christian gas hoists and attach. swingers.
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Model 1201 Lima Standard Shovel and Dragline. 80′ boom, 3 yard bucket; 32′6″ shovel boom, 22′ stick, 3½ yard dipper.

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48-B Bucyrus-Erie Combination Shovel and Dragline. Standard 2 yard shovel front, 65′ dragline boom.

3500 Manitowac Combination High Lift Shovel and Dragline. 75′ dragline boom, 3 yard bucket, 45′ boom, 34′ stick, 2 yard dipper.

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We carry in stock various sizes of Page automatic dragline buckets. We may have the size you need for immediate delivery.

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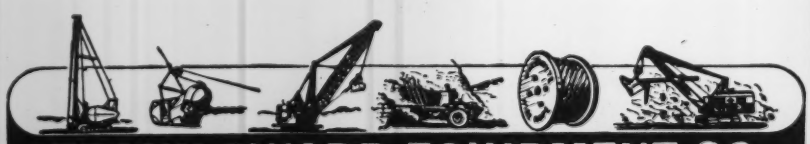

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Hazleton National Bank Bldg., Hazleton, Penna.

AIR COMPRESSOR — Ingersoll-Rand. Type 40, 7″ & 6¼″ x 7″, 156 CFM at 100#, 40 HP G.E. TEFC motor, 900 RPM 3-60-220-440, receiver, control.

ARC WELDERS — Electric, 300 & 400 amp., Hobart, G.E., rebuilt, guaranteed.

AIR RECEIVERS — 5′ x 14′ and 6′ 2″ x 20′ 6″, Vertical.

FLANGED GATE VALVES—Stainless Steel 1″ to 6″. Pioneer-Alloyco-Powell.

PUMPS — 3 —Gould 250 GPM 30′ Head w/o motor.

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BLOWERS—23—Buffalo 40″ Type R, Everdur Blades w/o motors

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(Other Blowers available up to 60,000 CFM.)

MOTORS — Vertical, gear head Crocker Wheeler, 10 HP TEFC, 220/440 volt, 1745 RPM, Phila. Gear output 425 RPM.

1—10 HP Sterling Type KRE enclosed Speed-trol motor 3/60/220/440 volt 1350/900 RPM.

Gen. Elec. 20 HP Squirrel Cage, 220 volt, 1160 RPM, type KT 322.

West. 125 HP Squirrel Cage, 220 volt, 1740 RPM, starter.

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CATERPILLAR BULLDOZERS

2—D8 cable bulldozers, new from factory 1946
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KOEHRING Longitudinal Finisher 11′ to 26′ width, including steel Transport Truck

At Our Yard.....$3500.00

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Allis-Chalmers, Model AD Tandem, General Motors Diesel, 12′ blade, new tires, excellent appearance.

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All in Excellent Condition

READY FOR IMMEDIATE DELIVERY

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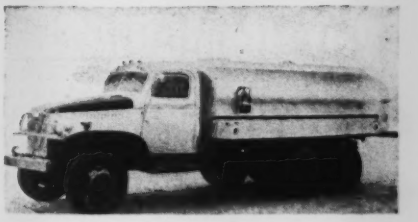
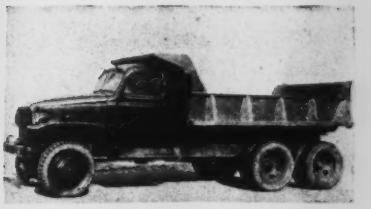


GMC CHASSIS, CAB, FUEL TANK

GMC 6 x 4 chassis and cab, with new 1350 gallon, 2 compartment fuel tank complete with pump, meter, hose, hose reel, nozzle, 7.50 x 20 tires all around.



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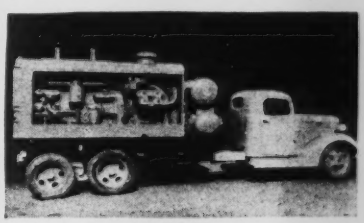
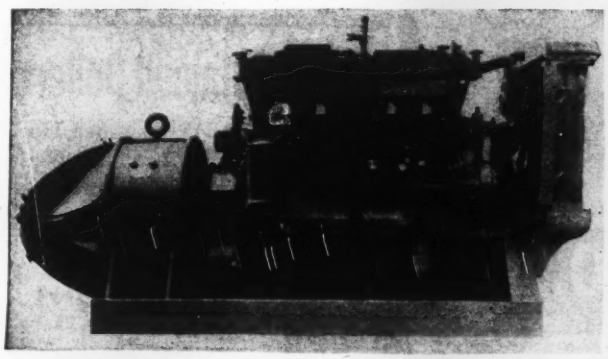
GMC 6 x 6 chassis & cab, 7.50 x 20 tires, reinforced frame & springs, new 4 yd. dump bodies. Also, 1942 Ford 134" and 158" wheel base, chassis and cabs only, or with new 6' x 8'—3 yd. dump bodies. Cargo, steel platform, or van bodies available for these chassis, if desired.



COMPRESSORS

500 cu. foot Ingersoll-Rand 2 stage air cooled diesel powered compressor illustrated. Other units available with various type mountings from 4 cu. foot up.



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15 KW to 180 KW alternating or direct current

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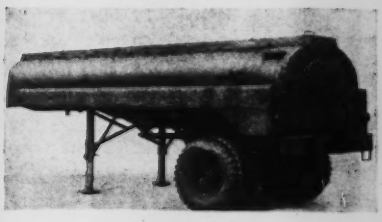
New Ross Model 19HT gasoline powered, pneumatic tired, fork lift trucks, 6000# capacity, adjustable forks. For use around factories, brick yards, docks, etc.



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New 2000 gallon, 2 compartment fuel tanks, with pump, hose, nozzle, etc., on semi-trailer mounting. Air or vacuum brakes. 9.00 x 20 dual rear tires. Can be furnished as full trailers with new front dollies.

Also available 17' x 7'8" x 6' all steel van bodies on full trailer mountings.

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CONVEYOR BELTING, TRANSMISSION BELTING, ELEVATOR BELTING, FIRE, WATER, AIR, STEAM, SUCTION and WELDING HOSE.

CARLYLE RUBBER PRODUCTS ARE NEW, GUARANTEED & LOW PRICED

NEW GUARANTEED

CONVEYOR BELTING

ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom Covers	Width	Ply	Top-Bottom Covers
48"	8	1/8" — 1/16"	24"	4	1/8" — 1/32"
42"	5	1/8" — 1/16"	20"	5	1/8" — 1/32"
36"	6	1/8" — 1/16"	20"	4	1/8" — 1/32"
30"	6	1/8" — 1/16"	18"	4	1/8" — 1/32"
30"	5	1/8" — 1/16"	16"	4	1/8" — 1/32"
26"	5	1/8" — 1/32"	14"	4	1/16" — 1/32"
24"	5	1/8" — 1/32"	12"	4	1/16" — 1/32"

Inquire For Prices — Mention Size and Lengths

TRANSMISSION BELTING — ENDLESS "V"

HEAVY-DUTY FRICTION SURFACE

	Width	Ply	Width	Ply	Width	Ply
Inquire For Prices — Mention Size and Lengths.	18"	6	10"	6	6"	5
	16"	6	10"	5	5"	5
	14"	6	8"	6	4"	5
	12"	6	8"	5	4"	4
	12"	5	6"	6	3"	4

"A" Width All Sizes —
"B" Width All Sizes —
"C" Width All Sizes —
"D" Width All Sizes —
"E" Width All Sizes —

Sold in Matched Sets.
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SPECIAL OFFER . . . HEAVY DUTY RUBBER HOSE

FIRE HOSE

APPROVED SPECIFICATION HOSE EACH LENGTH WITH COUPLINGS ATTACHED

I.D. Size	Length	Per Length
2½"	50 feet	$28.00
	25 "	16.00
2"	50 "	23.00
	25 "	13.00
1½"	50 "	20.00
	25 "	11.00

Specify Thread On Couplings

AIR HOSE

I.D. Size	Length	per Length	Universal Couplings
½"	25 feet	$5.00	$1.50 Pair
	50 "	10.00	1.50 Pair
¾"	25 "	7.50	1.50 Pair
	50 "	15.00	1.50 Pair
1"	25 "	10.00	1.50 Pair
	50 "	20.00	1.50 Pair

LARGER SIZES ALSO AVAILABLE
All Prices—Net — F.O.B. New York

WATER HOSE

I.D. Size	Length	per Length	I.D. Size	Length	per Length
¾"	25 feet	$4.25		35 feet	$10.50
	50 "	8.00		40 "	12.00
1"	25 "	6.25		50 "	15.00
	50 "	12.50	1½"	25 "	10.00
1¼"	25 "	7.50		35 "	14.00
				50 "	20.00

Each Length with Couplings Attached

CARLYLE RUBBER CO., Inc.

62-66 PARK PLACE, NEW YORK 7, N. Y. Phone: BArclay 7-9793

IMMEDIATELY AVAILABLE

ELEVATED STEEL WELDED BINS—3—32' x 30' with 27' bottom cone ⅜" plate.
1—Welded Bin 20' x 7'6", bottom cone 8'6", top cone, 5/16" plate.

CONVEYORS — Link Belt Drag Flight.

SPEED REDUCERS — 3 HP Du Falk 23.4 to 1.
10 HP D.O. James 42.3 to 1.

TRANSMISSIONS—Reeves #5D.

PIPE—Haveg, 2" to 18".
Rubber lined steel, 2" to 10".

DUCT—Rubber lined steel, 24" and 26".

VALVES & FITTINGS — Rubber lined steel.

TANKS—2—12' diam. x 36' horizontal rubber lined steel.

TOWERS—1—18' x 30' rubber lined steel.
9—11' x 18' rubber lined steel.
3—11' x 26' rubber lined steel.

STACKS—4' diam. x 82' rubber lined steel.

CENTRIFUGAL PUMPS — Deming 150 GPM 50' head 5 HP motor.
Fairbanks Morse 300 GPM 100' head 15 HP motor.
Chicago 4" x 4" Slurry 50 to 150 GPM 75' head no motor.

BLOWERS—#12 Type SE American.

HEAT & POWER CO., INC.

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Digby 8-0373

Self-Contained Boilers

Two (2) 250 HP Kewanee Hor. return tube, built 1941, Natl. Board Stamped, 125 lbs. pressure, with or without Riley Stokers. Immediate Delivery.

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WANTED

¾ to 5 yard Shovels
2 to 10 yard Draglines
Tractors and Dozers

FRANK SWABB EQUIPMENT CO., INC.
Hazleton National Bank Building
HAZLETON, PA.
Telephones 4911 and 4901-J

FOR SALE—Locomotive Cranes, all sizes
¾ yard Cranes, Draglines, Backhoes, Shovels
1¼ yard Bay City Dragline
1¼ yard Bucyrus Shovel
1¾ yard Marion Electric Shovel
1¾ yard Lima 750 Crane, Dragline
2 yard P & H, Model 855, Crane
2 yard Walker Moneyhan Dragline
Shovel Front for Koehring 301
"STONE the CRANE MAN, INC."
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TRENCHING MACHINES
Cleveland models 95 and 110
Barber Green model 44-C
Buckeye model 120 and C-15
P&H model 10-30, 12 ft. deep.
Cleveland Pioneer, 10 ft. deep.
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STORAGE BATTERY
LOCOMOTIVES
1½ to 10 Ton — 18" to 56" Track Gauge
GREENSBURG MACHINE CO.
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50-ton Vulcan gas-electric, std. ga. Overhauled, with Am. couplers.
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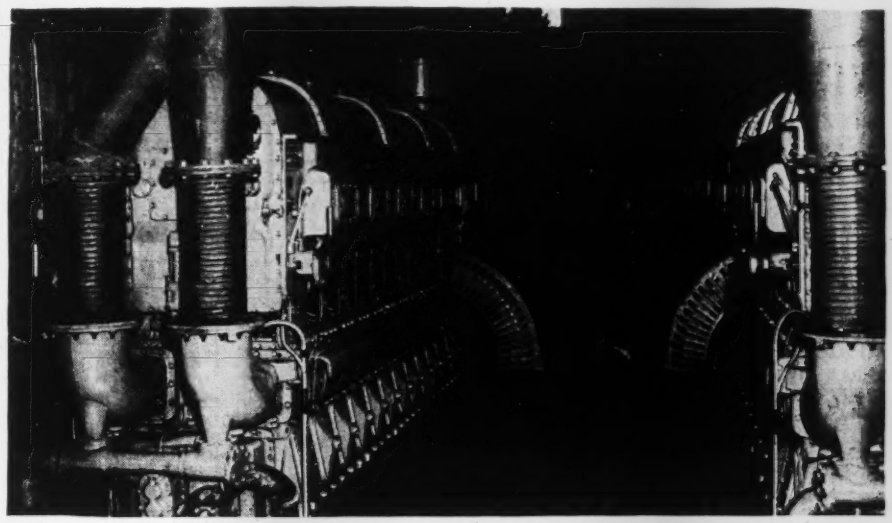
Pittsburgh 22, Pa.

AGSCO has DIESEL GENERATORS for *your* power needs



2—1250 KVA Units at Idaho Falls, Idaho installed by AGSCO

DIESEL GENERATORS

A.C. 50 AND 60 CYCLE

KVA	Make	HP	Model	RPM
1250	Fairbanks-Morse	1600	38D8-1/8	720
1250	Cooper-Bessemer	1500	LS-8	327
1250	Nelseco	1500	6MI-53	300
1250	General Motors	1600	16-278A	720
1000	Fairbanks-Morse	1200	38D8-1/8	600
900	General Motors	1200	12-567	720
625	Superior	750	OS	327
400	Ingersoll-Rand	460	S	600
300	Fairbanks-Morse	360	Y	257
240	General Motors	350	8-268A	1200
156	Fairbanks-Morse	150	32E14	300
125	General Motors	150	3-268A	1200
100	Buckeye	150	E	325
94	General Motors	160	6045A	1800
62	Int'l Harvester	76	UD-18	1000
37	Int'l Harvester	45	UD-14	1200

D.C. UNITS IN STANDARD AND SPECIAL VOLTAGES

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Cable Address: AGSCOMACH Phones: Digby 9-4350

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GRADER *For Sale*

Rome 404 Tandem Drive - Diesel

This machine has 12 ft. blade, scarifier, enclosed cab, serial #404-809. Used only three months, like new. Price $9,939.00 net f.o.b. Albany.

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2—Root-Connorville blowers, 10,000 CFM with 125 HP syn. motors
2—Root rotary blowers, size 7½, with 100 HP motors
2—Sullivan air compressors, 868, 1051 CFM
3—180 HP, 6 cyl. Fairbanks-Morse full diesel engines
2—260 HP, 6 cyl. Superior full diesel eng.
1—C. S. Johnson batch plant with 30 ft. dia. hex bin
1—15 x 24 Universal jaw crusher
1—28S Ransome concrete mixer
1—10S Jaeger concrete mixer
2—D8 tractors with dozers
1—Complete shovel attach. for Bucyrus 37-B, 1¼-1½ yd.
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11—Deepwell turbine pumps, 8" to 12", with motors
1—100 HP Sauerman drag scraper hoist, 2 drum
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Various electric motors 10 to 250 HP, transformers, centrifugal pumps 10 to 50 HP and other equipment.

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SPECIAL OFFER TO CONTRACTORS

8-10-12 POUND SLEDGES*
With Handles 95c EA. $10.00 Per Doz.

RAILROAD OR CLAY PICKS*
With Handles 80c EA. $9.50 Per Doz.

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With Handles 90c EA. $10.00 Per Doz.

Solid Shank-Round Point SHOVELS*
#2 WITH STEEL "D" HANDLE 55c EA. $6.00 Per Doz.

16-18-20 POUND CROW BARS*
HEAVY DUTY $1.95 EACH

11 FOOT PLOW STEEL CABLE SLINGS
Eyes spliced and Leaded..$2.25 $24.00 per doz.

* Govt. Used—Not Abused
Send Check or M.O.—No C.O.D.
All Shipments F.O.B. Phila. 3, Pa.

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J. JACOB SHANNON & CO.
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THE OLDEST EQUIPMENT HOUSE IN PHILADELPHIA

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5—Caterpillar DW10 Tractors with La-Plant Choat Model CW10 Scrapers in use 1200 hours or less, manufactured in 1946
1—Caterpillar Tractor Model 50 with winch and boom
1—Blaw Knox Concrete Spreader 20-25'
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Good, Modern, Used & New
EQUIPMENT

315 ft. 1946 I-R Diesel COMPRESSOR on Rbr.
14 S. Rex MIXER on St. Wheels.
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½ yd. Osgood TRUCK-CRANE on 10 Wh. "MACK".
10/15 ft. X-C Bi-Knox Rebit. Conc. FINISHER.
W-2 LeTour. 1946 Dbl. Dr. Shpslt. ROLLER.
10 ton 3 wh. Rebit. Buffalo Gas ROLLER.
105 ft. NEW LeRoi COMPRESSOR on Skids.
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8 ft. Frink. Vee SNO PLOW less Hoist.
New "MEYER" and "GLEDHILL" SNO PLOWS.
Etc.—Etc.

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Or call *THERESA* 74-F-3
Quality Since 1922

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One Allis Chalmers
BULLDOZER

With Baker Blade. Purchased new in July 1947. Worked 400 Hours. This machine is practically new. Immediate delivery.

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30,000 BBL. Steel Tank

1—Tank, 72' dia. x 40'7" high, 7-ring riveted construction, with steel cone roof and structural steel supports. Will quote standing location Oklahoma, or dismantled for re-erection. Write for complete specifications.

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1—1 cu. yd. Haiss Digging Bucket w/Teeth
1—18 ton Plymouth Std. Ga. Diesel Loco. New 1942
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1—80 ton American Type 0-6-0 Std. Ga. Sep. Tender Loco. Cyls. 21x28—New 1942
1—60 Ton G.E. Diesel-Electric standard gauge Locomotive. New 1942.

B. M. WEISS COMPANY
Girard Trust Co. Bldg.,
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AVAILABLE FOR IMMEDIATE DELIVERY
BELOW LIST PRICE

5 NEW MISSISSIPPI WAGONS
(Manfd. by M.R.S.)
Ideal for low-cost haulage
Capacity 8½ cu/yd/struck

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CLEARFIELD & MELVALE STS.
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CABLE SCRAPER

One NEW Gar Wood Model 515 Cable Scraper 18.00 x 24—16 ply single tires front and rear. Must be sold. Specially priced.

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Shovels & Truck Cranes
Lorain 78 Diesel 1½ cy shovel & 50' dragline
Marion 362 Diesel 1½ cy shovel & 60' dragline
Osgood "Conqueror" 1¼ cy shovel & 70' dragline
Lorain 40—¾ cy shovel, backhoe & 35' crane
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Lorain MC4 Moto Crane, 10 wheels, 15 tons
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Distributors for Pettibone Mulliken Corporation.

Clamshell - Dragline - Dipper and Pull Shovel Buckets

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The—FOLLOWING—MACHINES are Rebuilt and Guaranteed.

1—Haiss Wheel Loader Model 75W
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3 stage, 6" suction, 4" discharge

145 HP, 700 GPM, 200#
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LARGE and SMALL
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WELLPOINT CORPORATION
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STEAM LOCOMOTIVE CRANES

BROWNHOIST Serial 7312 40 tons @ 13 ft.
INDUSTRIAL Serial 2893 33 tons @ 12 ft.
ORTON-STEINBRENNER Serial 45292 22 tons @ 12 ft.
ALL COAL BURNERS - 50 FOOT BOOMS

Immediate delivery on own wheels
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1—Acme factory rebuilt 12 ton, 3 wheel roller
1—Gasoline powered 5-6 ton tandem, rebuilt.

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FRANKFORT, N. Y.

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1—Portable LeRoi Compressor, 315 cubic feet. Two stage.

HARRY C. LEWIS
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30 HP Christian, 2 drum, gasoline hoist with swinger
35 HP Jaeger, 2 drum, gasoline hoist with swinger
80 HP American, 2 drum diesel hoist with swinger
125 HP Christian, 2 drum, diesel hoist with swinger
125 HP Clyde, 3 drum diesel hoist with swinger
9 x 10 D.C. Lambert, 2 drum steam hoist, boiler type
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4 Ton Ingram steel stiffleg derrick—50 foot boom
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Schramm Compressors—Gasoline—Diesel—Electric in 20-35-60-105-210-315-420 cubic foot capacity

Attached and independent type boom swing gears
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SPECIAL—20 Ton steam locomotive Industrial Brownhoist Crane—Self propelling—50 foot boom.
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2 NEW 400 H.P. VERTICAL WESTINGHOUSE INDUCTION MOTORS

3 phase - 60 cycle
2200 Volt
700 R.P.M.
in original crates
very attractive price

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1—D-4 Cat. Tractor with high lift—used.
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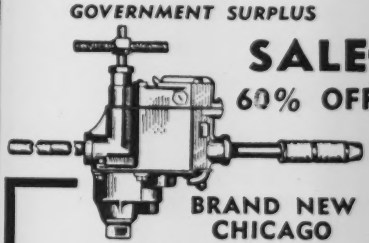

BRAND NEW CHICAGO
Pneumatic Model 327-700 C
Rotary Air Drills

Capacity: 7/8" (Actually 29/32)
Reaming Capacity: ¾"
Chuck: #2MT
Net Weight: 22¼ lbs.
Overall Length: 14⅝"

(List Price $218.00)
SALE PRICE BRAND NEW **$87.20**

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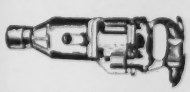

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Capacity 1¼"—Pistol Grip 16¾"—Overall Length 1" square shank—29½ lbs. Net Weight

(List Price $343.00 SALE PRICE **$223.00**

NEW CHICAGO Pneumatic

Model 330-S-4250 Rotary Grinder

Will take 8" x 1" wheel—4250 rpm— ⅝ arbor —Weight 14 lbs. Net—Length 21"

50% OFF (List Price $165.00) SALE PRICE **$82.50**

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Since 1890
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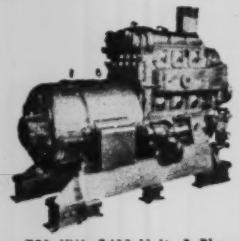

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300 KW, 450/2400 Volts, 3 Phase, 60 cycle, 1200 RPM, General Motors Model 8-268A
250 KW, 450 Volts, 3 Phase, 60 cycle, 1200 RPM, General Motors Model 8-268A
200 KW, 450/2400 Volts, 3 Phase, 60 cycle, 1200 RPM, General Motors Model 8-268A
125 KW, 220/440/2400 Volts, 3 Phase, 60 cycle, 1200 RPM, General Motors Model 3-268A
125 KW, 220/440/2400 Volts, 3 Phase, 60 cycle, 1200 RPM, Superior Diesel Model GDB-8
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¾ C.Y. General Invincible like new $4000 worth of New Parts including New Shovel Front-Shovel-Dragline-Crane $9450.00
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150' x 580'—80' high. Complete with two, 10 ton O.H. Cranes and Runways in two bays. Corrugated roofing and siding, steel sash.
All in excellent condition.

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5 Autocar Diesels, 15 cubic yard dump trucks, 10 wheelers.

Bargain price

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TRUCK MIXERS
Eight #2 Rebuilt High-discharge Truck Mixers, 2 cu. yd. capacity, available immediately, reasonably priced.
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Factory-New Shovels & Draglines
NORTHWEST model 6 Diesel 1½ cy shovel & dragline, wide cats
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BUCYRUS-ERIE 38B Diesel 1½ cy shovel & 80' Crane, wide cats
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RAILROAD DERRICK CAR
Capacity 50 tons at 40 ft. 70 ft. boom. Price $17,500.00.
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FOR SALE
25 Caterpillar D7 Blades at $500 each

New Army Surplus cable operated LaPlant Choate Bulldozer Blades. Complete with everything ready to mount on a Cat D7 Tractor including radiator guards, two braces, tractor mountings. Also new Gar Wood winches for TD18 International Tractors, new Front or rear mounted Le Tour power control units.

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1—Standard Shovel Boom and 2½ yd bucket for a Marion "392". Good condition.
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Several NEW NORTHWEST Model 25 Shovel Attachments Complete
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10 to 1000 H. P.
NEW-USED
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Steam, Gas and Electric Power Equipment
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10,000 BBL. Steel Tanks

3—Tanks, 48' dia. x 45'2" high, Graver Semi-Spheroid, 5-ring, riveted construction with steel cone roof and bottom, originally designed for 25# p.s.i. Will quote standing location Oklahoma, or dismantled for re-erection.

Write for complete specifications.

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FOR SALE
1 K30 LeTourneau Rooter
2 C-104 LaPlante Choate Scraper 30-Yd.
SWORDS-McDOUGAL CO.
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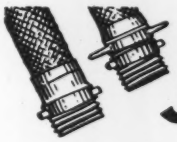
TRACTOR PARTS
Approximately $4500.00 worth of parts for HD-10 Allis Chalmers Tractors with serial numbers above 1600. Will sell at sacrifice.
GEORGE & LYNCH
General Contractors
Delaware Trust Building, Wilmington, Delaware



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Brand New 4-Inch

SUCTION HOSE

USES: Portable Pipe Lines; Handling Water, Liquids, etc.; Sewer & Trench Work; Manholes; Suction or Discharge on Pumps; Mines; General Heavy Duty suction work, etc.

DESCRIPTION: New Heavy-duty 4-inch inside diameter steel-reinforced Suction (or Discharge) Hose complete with male and female fittings. Abrasion-resistant rubber; heavy steel wire reinforcing; plies of heavy fabric. All in 10-ft. lengths complete with fittings. Smooth bore. Couplings are built-in, full flow, with fixed lug nuts on one end and hand lug swivel nuts on other end; recessed to hold washer in place when hose is disconnected; Eliminates necessity of using wrench.

SALE PRICE is less than ONE-FOURTH the regular NEW PRICE.

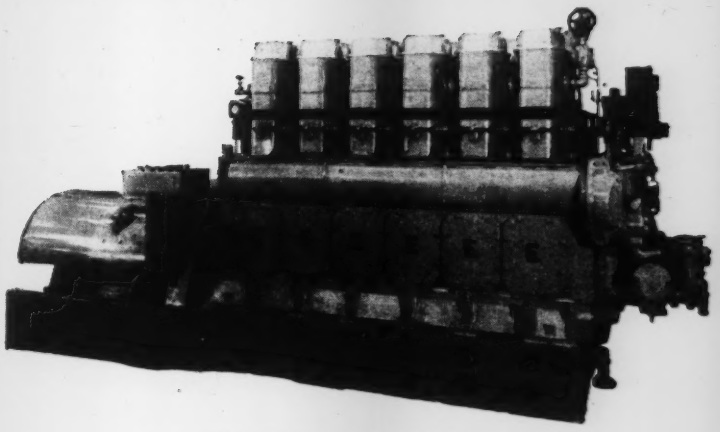
PRICE per 10-ft. length complete with male and female fittings, brand new $12.00

BERNSTEIN BROTHERS

SINCE 1890

Pueblo, Colorado Phone 8404

DIESEL GENERATORS



Delivery Today

COMPLETE GENERATOR POWER PLANTS

15—450 HP, Model DSG-6, 450 RPM, 12x15, 6 cylinder Diesel Engines direct connected to

15—250 KW. Elliott Direct Current Generators, 120/240 volt, 3 wire compound wound, 450 RPM. Complete with all necessary auxiliaries.

Large supply of brand new spare parts available

HP	MODEL	KVA	RPM	NEW	HP	MODEL	KVA	RPM	NEW
8—1600	General Motors 16-278A	1200	720	95%	10—225	Buckeye Model BO	180	600	new
1— 450	Fairbanks Morse 32F	375	360	95%	1— 180	Fairbanks Morse YVA	150	257	95%
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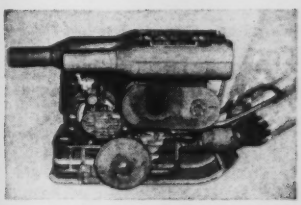

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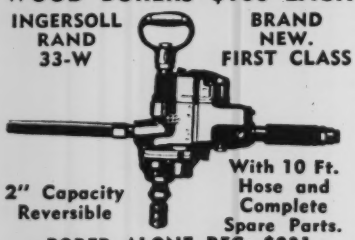

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OFFICIAL PROPOSALS

(Continued from page 122)

Bids: January 19, 1948 (996)

Intercepting Sewers and River Crossing

Contract No. 1

Port Huron, Michigan

Sealed proposals will be received by the City of Port Huron, Michigan, in the office of the City Clerk up to 2:00 o'clock P. M. E. S. T. of January 19, 1948 at which time and place all bids will be publicly opened and read aloud for the construction of the following approximate quantities of intercepting sewers:

4325 lin. ft. of 8" sewer
2135 lin. ft. of 10" sewer
1695 lin. ft. of 12" sewer
6715 lin. ft. of 15" sewer
1615 lin. ft. of 18" sewer
2635 lin. ft. of 24" sewer
4325 lin. ft. of 30" sewer
1675 lin. ft. of 42" sewer
17850 lin. ft. of 40" x 48" sewer in tunnel
815 lin. ft. of 54" sewer in tunnel

together with manholes, shafts, diversion chambers, river crossing and appurtenant structures.

The proposal, contract forms, plans and specifications under which the work will be done are on file and may be examined at the office of the City Engineer; City Hall, Port Huron, Michigan or at the office of Shoecraft, Drury and McNamee, Consulting Engineers, State Savings Bank, Ann Arbor, Michigan. Copies thereof may be obtained from the Consulting Engineers by making a deposit of Fifteen Dollars ($15.00) for each set of plans and contract documents. The full amount of the deposit for one set of plans and documents will be refunded to each bona fide bidder. Seven Dollars and Fifty Cents ($7.50) will be refunded for each copy of all other sets returned in good condition within ten (10) days after opening of bids.

The successful bidder will be required to furnish a satisfactory performance bond and labor and material bond.

A certified check for a sum not less than five percent (5%) of the amount of the proposal or bidder's bond in an amount of not less than five per cent (5%) of the amount of the proposal will be required with each proposal.

The right is reserved by the City to accept any proposal, to reject any proposal, and to waive informalities in proposals.

THE CITY OF PORT HURON, MICHIGAN
BY Allen R. Hill
City Clerk

U. S. Government

CORPS OF ENGINEERS, Baltimore District, Baltimore, Md.—Sealed bids will be received here until 11:00 a. m., January 9, 1948, and then opened for Construction of Sunbury, Pennsylvania Flood Protection Project, Lower Susquehanna River Section, Unit 1—Walls, Levees and Interceptor Sewers, and Unit 2—Pumping Stations. Plans may be obtained by a deposit of $25.00 per set per unit in the form of cash, CERTIFIED CHECK or postal money order payable to The Treasurer of the United States and mailed to the District Engineer, Baltimore District, Corps of Engineers, 24th Street and Maryland Avenue, P. O. Box 1715, Baltimore-3, Maryland. (988)

CORPS OF ENGINEERS, Baltimore District, Baltimore, Md.—Sealed bids will be received here until 11:00 a. m., January 6, 1948, and then opened for furnishing plant, labor and materials for Construction of Williamsport Flood Protection Project, Unit 3 Pumping Stations, Williamsport, Pennsylvania. Plans may be obtained by a deposit of $25.00 per set in the form of cash, CERTIFIED CHECK or postal money order payable to The Treasurer of the United States and mailed to the District Engineer, Baltimore District, Corps of Engineers, 24th Street and Maryland Avenue, P. O. Box 1715, Baltimore-3, Maryland. (987)

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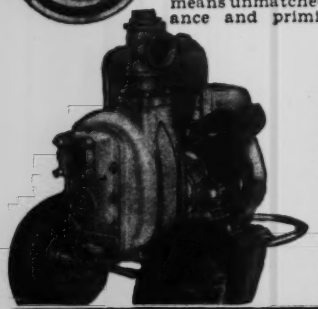

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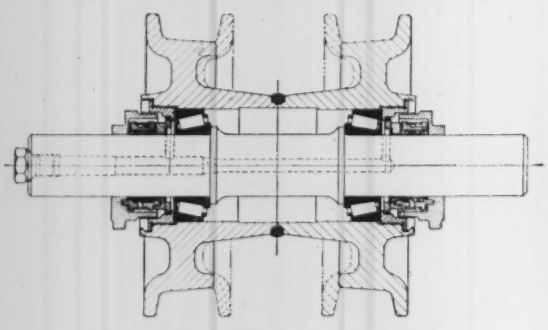
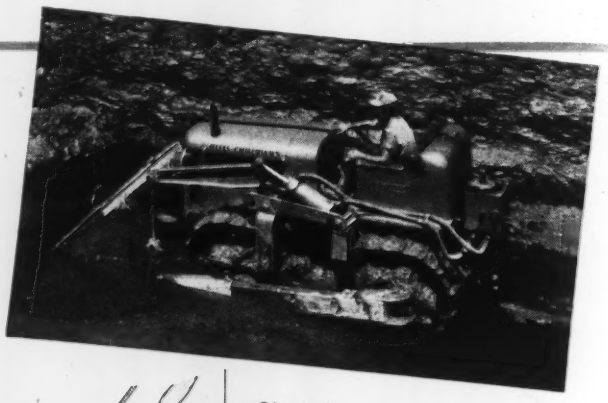
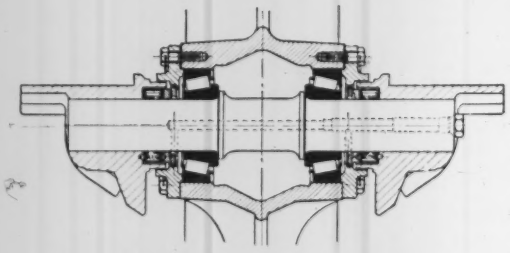
This symbol on a product means its bearings are the best.

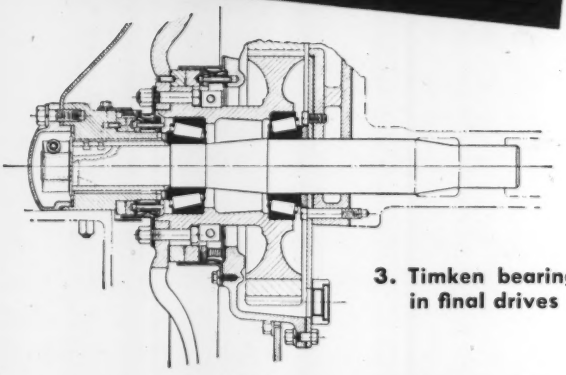


1. Timken bearings in truck wheels





2. Timken bearings in track idlers



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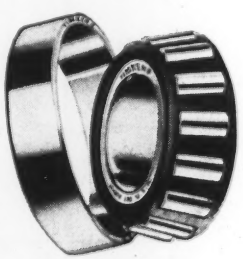

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